Aalto University
School of Business

INNOVATIVE CIRCULAR BUSINESS MODELS IN THE FINNISH CLOTHING SECTOR

Master's Thesis
Salla Neuman
Aalto University School of Business
Creative Sustainability
Spring 2021

Aalto University
School of Business

Aalto University, P.O. BOX 11000, 00076 AALTO
www.aalto.fi

Abstract of master's thesis

Author Salla Neuman

Title of thesis Innovative Circular Business Models in the Finnish Clothing Sector

Degree Master of Science in Economics and Business Administration

Degree programme Creative Sustainability

Thesis advisor(s) Minna Halme

Year of approval 2021 **Number of pages** 85 **Language** English

Abstract

Circular economy today is high on the agendas of researchers, policy makers and business managers alike. Moving from the current linear economy to a circular economy is seen as a solution to many of the sustainability challenges we are facing today, including climate change, biodiversity loss and the overconsumption of natural resources. Companies can engage in the circular economy by rethinking the way they create, deliver and capture value, by implementing circularity in their business models. Despite the increasing attention, the practical implementation of circular business models has not been extensively studied.

The textile and clothing industry is a great example of the linear model and known for its various negative impacts on both the environment and society. The highly popular fast fashion business model is behind the impacts and characterised by high amounts of production, short use phases and high amounts of waste ending up in landfills or incinerated. Circular solutions are needed to change the unsustainable industry paradigm. While previous research on circular business models in the context of textiles and clothing exist, no extensive studies involving multiple companies seem to have been conducted.

This study contributes to filling the identified research gap by looking for answers to the research questions of the study, *how do Finnish manufacturing clothing companies implement circularity in their business models*, and *what are the drivers, enablers and challenges for circular business model implementation*. The study was conducted as a case study researching the phenomenon of circular business model implementation. 65 Finnish manufacturing clothing companies were studied by using secondary data from the company web pages and seven of these companies more thoroughly by using primary data from semi-structured interviews. Thematic analysis was used to analyse and organise the empirical results.

The study proposes a framework that maps the possible circular business model types, or sub models, that can be implemented by manufacturing clothing companies in their business models alone or combined. The framework builds on the earlier work of Bocken and colleagues. In addition, drivers, enablers and challenges for implementing circular business models are mapped. This way, the study contributes both to the theoretical and practical understanding of circular business model implementation, especially in the context of textiles and clothing.

The studied 65 companies considered pioneers in circularity all engage in the long-life models. In addition, half of the companies engage in extending resource value and a quarter of them in service-based models. Only a few companies engage in use-based models. These models create both environmental, economic and customer value. Sustainability as a core value, increasing awareness, supportive customers and high-quality items work as the main enablers for the studied companies, while the biggest challenge identified is related to communicating circularity.

Keywords circular economy, business model, textile, clothing, sustainability

Aalto-yliopisto
Kauppakorkeakoulu

Aalto-yliopisto, PL 11000, 00076 AALTO
www.aalto.fi

Maisterintutkinnon tutkielman tiivistelmä

Tekijä Salla Neuman

Työn nimi Innovatiivisia kiertotalouden liiketoimintamalleja suomalaisella vaatealalla

Tutkinto Kauppatieteiden maisteri

Koulutusohjelma Creative Sustainability

Työn ohjaaja(t) Minna Halme

Hyväksymisvuosi 2021 **Sivumäärä** 85 **Kieli** Englanti

Tiivistelmä

Kiertotalous on tänä päivänä korkealla niin tutkijoiden, päättäjien kuin yritysjohtajienkin asialistalla. Siirtyminen nykyisestä lineaarisesta taloudesta kiertotalouteen nähdään ratkaisuna moniin kohtaamiimme kestävyyshaasteisiin, kuten ilmastonmuutokseen, luonnon monimuotoisuuden häviämiseen sekä luonnonvarojen ylikulutukseen. Yritykset voivat toteuttaa kiertotaloutta uudelleen miettimällä arvonluontimallinsa, tuoden kiertotalouden toimintoja liiketoimintamalleihinsa. Huolimatta kasvaneesta huomiosta, kiertotalouden liiketoimintamallien käytännön toteutusta ei ole toistaiseksi laajalti tutkittu.

Tekstiili- ja vaateteollisuus on loistava esimerkki lineaarisesta mallista, ja tunnettu lukuisista negatiivisista vaikutuksistaan sekä ympäristöön että yhteiskuntaan. Suosittu pikamuotiin perustuva liiketoimintamalli on näiden vaikutusten takana, tunnusmerkkeinään suuret tuotantomäärät, lyhyet käyttövaiheet ja valtava määrä kaatopaikoille tai poltettavaksi päätyvää jätettä. Kiertotalouden ratkaisuja tarvitaan muuttamaan alan kestämätön nykytila. Kiertotalouden liiketoimintamalleja tekstiili- ja vaatealalla on tutkittu, mutta kattavia usean yrityksen tutkimuksia ei näytä olevan tehty.

Tämä tutkimus täydentää osaltaan havaittua tutkimusaukkoa etsimällä vastauksia tutkimuskysymyksiin, *miten suomalaiset valmistavat ja valmistuttavat vaateyritykset toteuttavat kiertotaloutta liiketoimintamalleissaan,* ja *mitkä ovat kannustimet, mahdollistajat ja haasteet kiertotalouden liiketoimintamallien toteuttamiselle.* Tutkimus tehtiin tapaustutkimuksena, jossa tutkittiin kiertotalouden liiketoimintamallin toteuttamista ilmiönä. 65 suomalaista valmistavaa ja valmistuttavaa vaateyritystä tutkittiin hyödyntäen yritysten verkkosivuilla olevaa tietoa, ja seitsemän näistä yrityksistä perusteellisemmin hyödyntäen osittain jäsenneltyjä haastatteluja. Temaattista analyysiä hyödynnettiin empiiristen tulosten analysoinnissa ja järjestämisessä.

Tutkimuksessa luodaan viitekehys, joka kartoittaa mahdolliset kiertotalouden liiketoimintamallityypit, joita valmistavat vaateyritykset voivat toteuttaa yksin tai yhdistettynä liiketoimintamalleissaan. Kehys pohjautuu Bockenin ja kollegoiden aikaisempaan työhön. Lisäksi viitekehyksessä kartoitetaan kannustimet, mahdollistajat ja haasteet kiertotalouden liiketoimintamallien toteuttamiselle. Näin tutkimus osallistuu sekä teoreettisen että käytännön ymmärryksen lisäämiseen kiertotalouden liiketoimintamallien toteuttamisesta, erityisesti tekstiili- ja vaatealalla.

Tutkitut 65 yritystä, jotka nähdään kiertotalouden edelläkävijöinä, toteuttavat kaikki pitkäikäisyyteen perustuvia malleja. Lisäksi puolet yrityksistä toteuttavat materiaalien uudelleen hyödyntämistä, ja neljännes palveluihin perustuvia malleja. Vain muutama yritys toteuttaa omistamisen sijaan käyttöön perustuvia malleja. Nämä kiertotalouden liiketoimintamallit luovat sekä ympäristö-, taloudellista että asiakasarvoa. Kestävä kehitys yritysarvona, kasvava tietoisuus, asiakkaiden tuki sekä korkealaatuiset tuotteet toimivat tutkittujen yritysten tärkeimpinä mahdollistajina, kun taas suurin haaste liittyy kiertotaloustoimista viestimiseen.

Avainsanat kiertotalous, liiketoimintamalli, tekstiili, vaate, kestävä kehitys

Table of contents

1. Introduction **1**
1.1. Research background and context 1
1.2. Research gap 2
1.3. Research objectives and questions 4

2. Literature review **6**
2.1. Circular economy 6
2.2. Business models 10
2.3. Circular business models 13
2.3.1. Circular business model mapping tools 16
2.3.2. Circular business model types 17
2.3.3. Drivers, enablers and challenges 24
2.4. Circular economy in the textile and clothing industry 28
2.5. Literature review summary and theoretical framework 35

3. Research design and methods **37**
3.1. Research approach 37
3.2. Data collection 39
3.3. Data analysis 42
3.4. Evaluation and ethical considerations 44

4. Empirical findings **46**
4.1. Company introduction 46
4.2. Circular business model types 47
4.2.1. Long life models 47
4.2.2. Extending resource value 55
4.2.3. Access and performance 58
4.2.4. Extending product value 60
4.3. Circular business model implementation 63

5. Discussion and analysis **71**

6. Conclusions **80**
6.1. Main findings and theoretical contribution 80
6.2. Managerial implications 83
6.3. Limitations and suggestions for further research 83

References **86**

List of tables

Table 1. Circular business model types
Table 2. Drivers, enablers and challenges for CBM implementation
Table 3. Drivers, enablers and challenges found

List of figures

Figure 1. The circular economy system diagram
Figure 2. The Business Model Canvas
Figure 3. Theoretical framework
Figure 4. Revised theoretical framework and summary of findings
Figure 5. Number of CBM type examples found

List of abbreviations

BMC	Business Model Canvas
CE	Circular economy
CBM	Circular business model
EMF	Ellen MacArthur Foundation
PSS	Product-service system
SBM	Sustainable business model

1. Introduction

The first chapter of the thesis introduces the topic by describing the background and context of the research. This is followed by a discussion on the research gap, after which the research objectives and questions of the thesis will be introduced.

1.1. Research background and context

Climate change, loss of biodiversity, air, water and soil pollution, resource depletion, and excessive use of land, are among the various environmental problems that are threatening the life-supporting systems on Earth (Geissdoerfer, Savaget, Bocken and Hultink, 2017). It is increasingly acknowledged that these various environmental, and the social and economic challenges we are facing today, require a fundamental societal change in order to move towards sustainability (Hofmann, 2019). Sustainability, according to the most established definition, is "development that meets the needs of the present without compromising the ability of future generations to meet their own needs" (Brundtland, 1987).

Circular economy (CE) is seen as an important solution to addressing the sustainability challenges, with the focus on environmental and economic issues (Geissdoerfer et al., 2017), and more precisely, on creating economic growth while protecting the environment (Lieder and Rashid, 2016). Indeed, the concept has been trending and gaining increasing attention from researchers, practitioners and policy makers during the past years (Homrich, Galvão, Abadia and Carvalho, 2018; Kirchherr, Reike and Hekkert, 2017; Korhonen, Nuur, Feldmann, and Birkie, 2018; Murray, Skene and Haynes, 2017, Urbinati, Chiaroni and Chiesa, 2017). For example, the number of academic publications on CE has increased over tenfold during the last decade (Geissdoerfer et al., 2017).

The growing population and middle class, and consequently, the increasing consumption, are putting even more pressure on resources, making business-as-usual no longer an option (Bocken, Schuit and Kraaijenhagen, 2018). Companies are in an urgent need of transforming their business models. Business models for circular economy, hereafter

circular business models (CBMs), are seen as a solution. These models focus on product-service systems (PSSs), durable, repairable and recyclable items, and conscious sales. (Hofmann and Jaeger-Erben, 2020). Companies are increasingly becoming aware of the possibilities of CE and starting to realise the potential value both for themselves and the stakeholders (EMF, 2013). Despite the growing awareness, CE implementation today continues to be limited (Henry, Bauwens, Hekkert and Kirchherr, 2020).

The textile and clothing industry is a great example of the limits of the current linear "take-make-dispose" economy (Koszewska, 2018). The linear system can be described with the extraction of large amounts of non-renewable resources for production, short use-phases, and high volumes of clothing ending up landfilled and incinerated (EMF, 2017). The environmental impacts of the industry and its complex global supply chains are huge in terms of CO2 emissions, water use, chemical pollution, oceanic microplastic pollution and waste creation. The highly successful fast fashion business model, characterised with low prices and fast changing trends, can be found behind these impacts. (Niinimäki et al., 2020). EMF (2017) has estimated that the amount of clothes produced has approximately doubled in the last 15 years and the number of times a single item is used has decreased by 36 percent on a global average. Circular economy is suggested as a solution to change the current unsustainable fashion paradigm. Truly, the environmental sustainability challenges of the industry can be targeted by promoting CE, by keeping the items and materials in use for as long as possible. For example, it has been estimated that if the times a piece of clothing is worn were doubled, the industry's greenhouse gas emissions would decrease by 44 percent on average (EMF, 2017). The shift from a linear to a circular economy in the industry requires new, circular business models. (Niinimäki et al., 2020)

1.2. Research gap

Despite the increased attention towards CE and CBMs specifically, there seems to exist a major research gap regarding the implementation of CBMs. For example, Rosa, Sassanelli and Terzi (2019), based on an extensive literature review on CBMs, identified the lack of guidance in transforming a business model from linear to circular, as a major research gap.

The authors state that theoretical concepts and best practices described in literature are not always easy to understand nor adopt by SMEs. Similarly Pieroni, McAloone and Pigosso (2019), in a systematic literature review on circular and sustainable business model innovation, suggested empirical research on the topic in order to move forward from the theoretical and experimental stage of approaches and support their maturation. Kirchherr et al. (2017) argued that examples of CE implementation may support the understanding of the circular economy concept among practitioners and researchers alike, suggesting future research detailing the good practices. Moreover, Rosa et al. (2019) suggested empirical research to find out the most suitable business model archetypes to achieve CE in different fields. Merli, Preziosi and Acampora (2018) suggested more research on the less examined "slowing the loop" business models. In addition, more research on the enablers and barriers to CBM implementation are needed (Rizos et al., 2016), and on industry specific barriers (Vermunt et al., 2019).

Previous research on CE in the textile industry in Finland has focused on consumer perceptions and design strategies. More precisely, Armstrong et al. (2015) studied consumer perceptions of product-service systems for clothing as consumption alternatives, and Niinimäki and Hassi (2011) researched emerging design strategies such as repair, recycling and renting services as opportunities for radical change in sustainable textile production and consumption. Additionally, Vehmas et al. (2018) conducted a study on consumer attitudes towards circular clothes made from recycled textile waste, and on how circularity should be communicated and marketed. Thus, empirical research on circular business models in the textile industry in Finland seems to be lacking.

In the context of the textile industry in general, CBM implementation has been studied in a single case study of Patagonia (Rattalino, 2018). Other studies have focused on specific models and aspects. For example, Stål and Corvellec (2018) studied the adoption of take-back systems in a case study of seven Swedish clothing companies, while Pedersen et al. (2019) studied organisational complexities in designing CBMs. In addition, challenges and solutions in developing a take-back service (Kant Hvass and Pedersen, 2019), challenges in transitioning to CE, especially in closing the loop (Koszewska, 2018), and challenges in transforming items to correspond to the principles of CE (Franco, 2017) have

been studied. These researchers suggest future research for example on CBM types (Rattalino, 2018), and different combinations of these types (Pedersen et al., 2019). Additional suggestions include research on challenges related to circular product design, business models and take-back strategies (Franco, 2017), and on barriers for CBMs (Kant Hvass and Pedersen, 2019). While previous research on the topic exists, no comprehensive studies on different CBM types nor on the drivers, enablers and challenges have been conducted involving multiple companies.

In summary, room for more research on CBMs, their implementation, and the related drivers, enablers and challenges exist both in general, in the context of the textile and clothing industry, and in the context of the textile and clothing industry in Finland specifically. Researching the topic is important as according to Stahel (2016), in order to realise a circular economy, research demonstrating the feasibility of CE for companies is needed. In addition, in order to target the major challenges of the textile industry, it is important to study for example what are the needed elements in innovative CBMs to be able to successfully increase clothing utilisation, as stated by EMF (2017). With the research objectives and questions presented in the following subchapter, I aim to contribute in filling these gaps.

1.3. Research objectives and questions

In the thesis, I examine the implementation of circular business models among Finnish textile companies. Furthermore, I study what are the drivers, enablers and challenges for circular business model implementation. The thesis is conducted under FINIX, a research project on sustainable textile systems that "helps co-creating resource-wise textile business in Finland in ways that promote global sustainable development" (FINIX, 2019). Circular economy management is one of the core research areas of FINIX and described in the webpage as follows: "New breakthroughs in the area of managing circular economy, including a better understanding of service-intensive and systemic business models and business models under decreasing consumption as well as novel business ecosystems that balance the interests of private ownership and public resources." (FINIX, 2019). The thesis aims to provide value for FINIX and its aim of creating the ability for Finnish textile

industry to thrive in a circular economy. More closely, the research problem is related to FINIX's #kestävävaate (sustainable clothing) campaign that was launched in spring 2020 to help consumers identify Finnish companies that are creating circular economy -based ways of consuming textiles, and support the pioneering companies as they were facing challenges due to the COVID-19 situation. In the campaign, the companies were listed and evaluated based on circularity and sustainability criteria. (FINIX, 2020a). The list of companies works as a starting point for the data collection in the thesis. The study focuses on manufacturing clothing companies that formed the majority of the companies on the list.

Importantly, the thesis aims to contribute to the academic discussion on circular business model implementation and the related drivers, enablers and challenges, especially in the context of the textile and clothing industry. Bocken, de Pauw, Bakker and van der Grinten (2016), in their study, developed circular business model types for both slowing and closing the loop, and suggested case studies to test these models in practice. The study aims to provide information on the practical implementation of these or similar models. Hence, the focus will be on slowing and closing the loop models and not on narrowing the loop business models. Building on the models, I will propose a framework of possible circular business model types for manufacturing clothing companies including the main drivers, enablers and challenges. This way, the thesis also aims to contribute to the practical understanding of the topic and support companies in moving from linear to circular business practices and developing the circularity of the operations further. Furthermore, the thesis will support my professional development by allowing me to specialise in circular business models overall, and in the context of textiles specifically.

To contribute in filling the identified research gaps, the following research questions will be examined using a literature review on circular business models, and primary and secondary empirical data from companies on the #kestävävaate campaign's list:

1. How do Finnish manufacturing clothing companies implement circularity in their business models?

2. What are the drivers, enablers and challenges for circular business model implementation?

2. Literature review

In this chapter, previous literature on circular business models will be reviewed. The literature search was conducted in Scopus and Web of Science databases with the search terms 'circular economy business model'. First, the history and the current understanding of a circular economy will be introduced, followed by an introduction of the business model and sustainable business model concepts. Second, circular business models (CBMs), CBM mapping tools, CBM types, and drivers, enablers and challenges for implementing CBMs will be reviewed. Third, circular economy (CE) and CBMs will be discussed in the context of the textile and clothing industry, and finally, a theoretical framework will be proposed.

2.1. Circular economy

The aim of CE is to enable economic growth while protecting the environment (Lieder and Rashid, 2016), that is, to decouple it from the depletion of natural resources and environmental degradation (Murray et al., 2017). This can be achieved by keeping the natural resources in use for as long as possible and preserving the value of items (Hofmann, 2019). CE is considered as a pathway for restructuring the current linear economic system, the 'take-make-dispose' economy (Merli et al., 2018), characterised with numerous challenges and limitations (Lieder and Rashid, 2016), such as neglecting the finite nature of natural resources (Ghisellini et al., 2016). CE, truly, has been recognised as the path towards balanced and sustainable development (Merli et al., 2018).

While CE has been gaining increasing attention recently, the notion has been around for decades and is related to various schools of thought. The roots of CE date back all the way to 1966 when Boulding, in his book *The Economics of the Coming Spaceship Earth,* proposed the concept of circular material flows, claiming that in order to ensure human life on Earth long-term, circular systems are needed. This was followed by the pioneering work

of Pearce and Turner in 1989, arguing that the linear economy must be replaced by a circular one in order to enable sustainability. (Geisendorf and Pietrulla, 2018). However, a closed-loop economy was discussed by Stahel already in the early 1980s (Geissdoerfer, Morioka, de Carvalho and Evans, 2018; Murray et al., 2017). Other concepts related to circular economy include cradle to cradle (McDonough and Braungart, 2002), regenerative design (Lyle, 1994), blue economy (Pauli, 2010), industrial ecology (Graedel and Allenby, 1995), performance economy (Stahel, 2010), natural capitalism (Lovins, Lovins and Hawken, 1999), biomimicry (Benyus, 1997), and industrial metabolism (Ayres, 1994; Geisendorf and Pietrulla, 2018; Homrich et al., 2018).

Despite the popularity of the concept among scholars, practitioners and politicians, authors seem to agree that no common definition for circular economy exists. The findings of a systematic literature review on CE demonstrate that the concept is evolving, and the boundaries and principles still require consolidation (Merli et al., 2018). In the most cited article, circular economy is defined as follows: "a regenerative system in which resource input and waste, emission, and energy leakage are minimised by slowing, closing, and narrowing material and energy loops. This can be achieved through long-lasting design, maintenance, repair, reuse, remanufacturing, refurbishing, and recycling." (Geissdoerfer et al., 2017, p.759). In the second most cited paper, in turn, the following definition is given: "A circular economy describes an economic system that is based on business models which replace the 'end-of-life' concept with reducing, alternatively reusing, recycling and recovering materials in production/distribution and consumption processes, thus operating at the micro level (products, companies, consumers), meso level (eco-industrial parks) and macro level (city, region, nation and beyond), with the aim to accomplish sustainable development, which implies creating environmental quality, economic prosperity and social equity, to the benefit of current and future generations." (Kirchherr et al., 2017, pp.224-225).

Another widely used definition is the one by the Ellen MacArthur Foundation (EMF, 2013, p.7): "an industrial system that is restorative or regenerative by intention and design. It replaces the 'end-of-life' concept with restoration, shifts towards the use of renewable energy, eliminates the use of toxic chemicals, which impair reuse, and aims for the

elimination of waste through the superior design of materials, products, systems, and, within this, business models". The Ellen MacArthur Foundation (EMF) was established in 2010 to accelerate the shift towards CE (EMF, 2015b). The foundation's work is recognised in the field and it has published numerous publications on the topic (Geissdoerfer et al., 2017), including the report *A new textiles economy: Redesigning fashion's future* (EMF, 2017).

In practice, the aim of CE is to maximise the value of materials and items at each point of their life. Concerns over climate change and resource scarcity are shifting the approach to seeing materials worth preserving instead of continuously consuming (Stahel, 2016). As opposed to a linear economy, where resources are extracted to create items that quickly become waste (Urbinati et al., 2017), in CE, production is replaced with sufficiency, that is, reusing, repairing, remanufacturing and recycling are preferred. Items at the end-of-use phase are turned into resources for others, resulting in closed loop industrial ecosystems and minimal waste. This way the whole economic logic is changed. The reprocessing of materials and items creates new jobs and reduces resource and energy consumption, and waste generation. (Stahel, 2016). Accordingly, radical changes in production and consumption are needed (Mendoza, Sharmina, Gallego‐Schmid, Heyes and Azapagic, 2017).

McDonough and Braungart (2002) identified two different resource flow cycles, the biological cycle and the technical cycle, demonstrated in figure 1 below. In the former, organic material and nutrients are designed to be returned back to the system without harming the environment, for example through composting, this way providing food to the system. In the latter, inorganic and synthetic materials and items are kept in use and their value is preserved. The inner loops of technical cycles, based on reusing, repairing, refurbishing and remanufacturing should be preferred over the outer loop based on recycling. This is because the inner loops require less energy and resources, this way also being more economic. (Korhonen et al., 2018). Different R frameworks, such as 3Rs (reduce, reuse, recycle), are considered a main principle of CE and guide the implementation of circularity. Again, 'reduce' is the preferred strategy, followed by 'reuse' and 'recycle'. (Kirchherr et al., 2017).

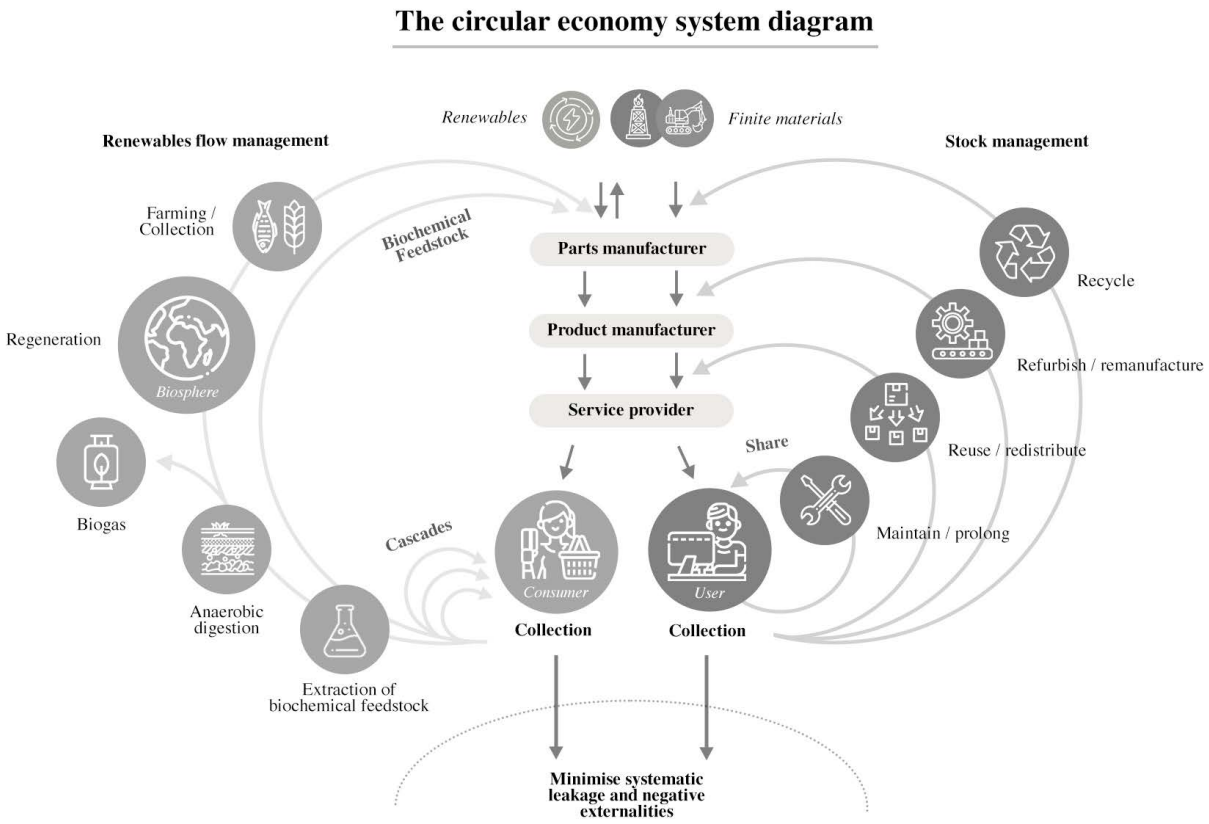

Figure 1. The circular economy system diagram. Adapted from EMF (2015b), originally from Braungart and McDonough.

CE, today, is high on the agenda of policy makers. The European Green Deal by the European Commission adopted the *Circular Economy Action Plan* in March 2020. The common strategy is set to make CE mainstream, playing a major role in achieving climate-neutrality by the year 2050, decoupling economic growth from resource consumption, and ensuring the long-term competitiveness of the EU. A product policy framework will be established to make sustainable and circular business models, products and services the norm, starting with the most important value chains, textiles being one of them. Additional measures will be taken to decrease the amount of waste and to ensure a competitive market for secondary raw materials of high quality within the EU. (European Commission, 2020). In addition, a strategic programme to promote CE in Finland is currently being prepared with the aim of transforming the economy from linear to circular by 2035 and boosting the role of Finland as a pioneer in CE (Ministry of the Environment, 2020).

The connection between CE and sustainability is widely discussed by researchers, and CE is often being considered under the wider umbrella of sustainability (Merli et al., 2018). Geissdoerfer et al. (2017), for example, state that while the aim of sustainability is to benefit all the three pillars, the environment, economy and society, CE focuses on environmental and economic benefits, and only implicitly on social issues such as job creation. Indeed, the social impacts of CE are only narrowly discussed in academic research (Homrich et al., 2018; Merli et al., 2018; Murray et al., 2017). According to Kirchherr et al. (2017), in the CE definitions, economic prosperity is highlighted over ecological prosperity, especially among practitioners, and the link between CE and sustainability is not straightforward. On the other hand, CE is seen as one solution towards sustainability, and a more tangible way of reorganizing the economy and society (Geissdoerfer et al., 2018). It has the potential to address many of the global sustainability challenges including climate change, biodiversity loss, resource depletion, water stress and economic failure (Moreno, De los Rios, Rowe and Charnley, 2016).

In order to move from a linear to a circular economy on a micro-level, companies need to design circular business models (Lewandowski, 2016). This includes rethinking the way they create, deliver and capture value (Lüdeke-Freund, Gold and Bocken, 2019). The following section introduces the concept of business model, and discusses business model innovation for sustainability and circularity, and finally, sustainable business models.

2.2. Business models

The business model concept became popularised in the beginning of the era of the Internet, and has been mainly employed in the contexts of e-business, strategic issues and innovation. In 2011, Zott, Amit and Massa discussed business models as a new unit of analysis without a common language. Truly, it has been widely acknowledged that no common definition for a business model exists, despite the popularity of the concept among businesses and academia (Osterwalder and Pigneur, 2010). According to the definition by Amit and Zott (2001, p.511), a business model describes “the content,

structure, and governance of transactions designed so as to create value through the exploitation of business opportunities".

In a paper by Teece (2010), the most cited paper on business models in the management field, it is stated that "a business model describes the design or architecture of the value creation, delivery and capture mechanisms employed" (p.191). More closely, a business model expresses the value a company delivers to its customers, the way it organises the value creation, and the way it captures a part of the value in revenues. In other words, it describes how a company delivers products and services to customers, and how it makes money (Richardson, 2008). It takes a system perspective on business operations and considers the activities of the company and its partners (Zott et al., 2011). Designing a commercially viable business model is essential as the company is first established, and keeping it viable is a continuous task. It requires creativity, insight and information on customers, competitors and suppliers. Having a differentiated, hard to replicate, effective and efficient business model is important in order to create competitive advantage and generate profit. (Teece, 2010).

Similar to Teece's definition, Osterwalder and Pigneur (2010, p.14) define a business model as "the rationale of how an organization creates, delivers and captures value". According to them, a business model consists of nine components: 'customer segments', 'value proposition', 'channels', 'customer relationships', 'revenue streams', 'key resources', 'key activities', 'key partnerships', and 'cost structure'. Together these components form the widely used Business Model Canvas framework presented in figure 2 below with definitions for each component. The framework has many similarities to Richardson's (2008) business model framework, in which the components are categorised simply under 'the value proposition', 'the value creation and delivery system' and 'value capture'.

Key partners Network of suppliers and partners conducting	**Key activities** Activities needed to offer and deliver the value proposition	**Value Proposition** Products and services solving customers'	**Customer Relationships** Types of relationships established and	**Customer Segments** One or several groups of people or companies

<table>
<tr><td rowspan="2">outsourced activities and offering resources acquired outside the company</td><td></td><td rowspan="2">problems and satisfying needs</td><td>maintained with each segment</td><td rowspan="2"></td></tr>
<tr><td>Key Resources

Assets required to offer and deliver the value proposition</td><td>Channels

Communication, distribution and sales channels</td></tr>
<tr><td colspan="3">Cost Structure

The costs incurred to operate the business model</td><td colspan="2">Revenue Streams

Cash generated from value proposition offered to customers</td></tr>
</table>

Figure 2. The Business Model Canvas. Adapted from Osterwalder and Pigneur (2010).

Business model innovation refers to designing a new business model or reconfiguring the elements of an existing one (Zott et al., 2011). Systemic thinking is needed in making changes in the business model, instead of focusing on a certain activity only (Amit and Zott, 2012). Innovating a business model is seen as a key to company performance and as a means to renew and transform (Zott et al., 2011). Business model innovation might create new opportunities for making profit (Amit and Zott, 2012), and keeping up with the competition (Osterwalder and Pigneur, 2010). As the attention to CE and sustainability is increasing, business model innovation for circularity and sustainability is becoming essential for the competitiveness of a company (Pieroni et al., 2019). It is also considered as a key to promoting environmental and social sustainability within the industrial system (Lüdeke-Freund, 2010).

Sustainable business models (SBMs) help companies integrate sustainability in their operations and create competitive advantage, while considering the interests of society and environment. Bocken et al. (2014, p.44) define SBM innovations as "innovations that create significant positive and/or significantly reduced negative impacts for the environment and/or society, through changes in the way the organisation and its value-network create, deliver value and capture value (i.e. create economic value) or change their value propositions". A sustainable business model, in turn, is defined by Lüdeke-Freund (2010, p.23) as "a business model that creates competitive advantage through superior customer value and contributes to a sustainable development of the

company and society". According to Boons and Lüdeke-Freund (2013), in a sustainable business model, the value proposition should offer measurable environmental and/or social value in addition to economic value, all the actors involved should operate in a sustainable manner, the customers should be motivated to be responsible in their consumption, and the financial cost and benefits should be fairly distributed and the financial model should take the environmental and social impacts into account.

Bocken et al. (2014), in the most cited paper on SBMs, created a categorisation of different SBM types based on a literature and practice review. The categorisation resulted in the following eight archetypes: 'maximize material and energy efficiency', 'create value from waste', 'substitute with renewables and natural processes', 'deliver functionality rather than ownership', 'adopt a stewardship role', 'encourage sufficiency', 'repurpose for society/environment' and 'develop scale up solutions'. Many of these archetypes work as a basis for the CBM types presented later on in the chapter.

The connection between SBMs and CBMs has been discussed in various papers. Pieroni et al. (2019), in a systematic literature review, argue that both sustainable and circular business model innovation seek to create superior customer value and boost resource efficiency, longevity, and economic growth. Sustainable business model innovation additionally considers social aspects such as ethical sourcing, locality and engagement, and work enrichment. Researchers seem to agree that circularity is a driver of sustainability and CBMs can be considered a subcategory of SBMs (Bocken et al., 2014; Rosa et al., 2019). Yet, they do have additional characteristics that are considered with narrowing, slowing and closing resource loops (Geissdoerfer et al., 2018). In the following section, CBMs will be given a closer look.

2.3. Circular business models

Research combining business models and circular economy has been conducted only for five years, and as a consequence, the field of study remains fragmented and is still in the stage of conceptualisation (Pieroni et al., 2019). It is widely recognised that a common framework to support researchers and businesses in designing and implementing circular

business models is lacking. (Lieder and Rashid, 2016; Murray et al., 2017; Pieroni et al., 2019; Urbinati et al., 2017). A paper investigating 114 different definitions given for circular economy found that business models were mentioned in only 11 percent of the definitions. The authors note that business models must be given a lot more emphasis if the private sector is expected to lead the CE transition. They even state that "a CE understanding lacking business models is one with no driver at the steering wheel". (Kirchherr et al., 2017, p.228). CBMs, indeed, are considered as a key enabler to move from a linear to a circular economy (Bocken et al., 2016; Lewandowski, 2016; Nußholz, 2017).

Nußholz (2017) continues that despite the attention from researchers, practitioners and policymakers, no common definition for CBMs exists. The concept combines business models from the management field and circular strategies from the resource efficiency field. Based on a review of recent academic literature on CBMs, Nußholz (2017, p.12) proposes the following definition: "a circular business model is how a company creates, captures, and delivers value with the value creation logic designed to improve resource efficiency through contributing to extending useful life of products and parts (e.g. through long-life design, repair and remanufacturing) and closing material loops". The author concludes that while there are differences in how CBMs are understood by different researchers, there seems to be a consensus on certain aspects. In CBMs, primary material input is substituted with secondary production, product life is extended by designing for long life and enabling second life through repair or remanufacturing, and finally, materials are recycled. Consensus on whether resource efficiency strategies in production phase, such as material leakage and emission reduction, are to be included in CBMs is lacking. (Nußholz, 2017)

Implementing circular strategies in the business model requires rethinking the value creation logic to ensure economic benefits (Nußholz, 2017). The value proposition in CBMs comprises a circular product or service, or a product-service system (Lewandowski, 2016). The right customer segments need to be identified, such as environmentally aware customers and customers valuing durable items. The customer relationships need to be strengthened, for example to enable the return flow of used items. Also resources and

channels need to be adjusted for collecting used items. Companies need to decide their key activities and whether to conduct resource recovery in-house or outsourced. Key partners in CBMs include secondary material and service providers. (Nußholz, 2017). New value networks are needed to perform repair, reuse and recycling activities, and to allow product returns from customers (Manninen et al., 2018). Collaboration with actors both from the core-business network and with other stakeholders is seen as essential (Antikainen and Valkokari, 2016; Fontell and Heikkilä, 2017). The higher initial prices of long-life items, maintenance and repair services, reselling items, and selling access to items offer new possibilities for revenue creation. Also possible cost reductions might be gained through lower-priced secondary inputs. (Nußholz, 2017)

In CBMs, the increased product longevity leads to slower product replacement and reduced resource use (Murray et al., 2017). While the value creation in linear BMs is mainly based on using virgin materials, CBMs enable creating economic value by reusing materials and items (Bocken, 2016; Linder and Williander, 2015). The idea of reuse is to replace high impact primary production with lower impact secondary production (Nußholz, 2017). Moreover, the value creation logic is shifted from selling items to offering services and capabilities (Urbinati et al., 2017). This way, CBMs are expected to reduce negative environmental impacts, while creating additional revenue, cost savings and new customer experiences (Lüdeke-Freund et al., 2019).

The environmental value creation in CBMs, however, is not straightforward. Several researchers make the note that CBMs do not necessarily create environmental benefits (Bocken et al., 2018; Manninen et al., 2018; Nußholz, 2017). Careful business model design is needed to create positive and avoid creating negative environmental impacts (Hofmann, 2019; Mont, 2002; Tukker, 2004). For example, Zink and Geyer (2017) discuss the risk of circular economy rebound, an increase in production and consumption, which reduces the environmental benefits created by CE. This may happen when secondary products fail to compete with primary products or cause lowering of prices, this way increasing the overall amount of consumption. To avoid the rebound effect, secondary products should be good substitutes for the primary alternatives and focus should be on markets where buyers have low price sensitivity. What is more, the implementation of

CBMs has been slow (Guldmann and Huulgaard, 2020; Stål and Corvellec, 2018, Vermunt et al., 2019). In Bocken, Miller, Weissbrod, Holgado and Evans (2019), it is stated that CBMs are not widespread as they depart from the dominant business models and require changes in many components of the business model.

2.3.1. Circular business model mapping tools

The Business Model Canvas (BMC) by Osterwalder and Pigneur (2010) and the ReSOLVE-framework by EMF are the most used tools by companies in creating CBMs (Mendoza et al., 2017; Rosa et al., 2019). The ReSOLVE-framework consists of six actions that businesses can take to become circular: Regenerate, Share, Optimise, Loop, Virtualise and Exchange (Rosa et al., 2019). 'Share', for example, refers to prolonging the life of items through design for durability, and through share, reuse and repair services (EMF, 2015a). The following paragraphs will focus on the BMC.

The BMC has been modified by various researchers in order to make it suitable for mapping CBMs (Rosa et al., 2019). Lewandowski (2016), based on an extensive literature review on CBMs, and the ReSOLVE framework, adjusts the original BMC and identifies two additional blocks, 'take-back system' and 'adoption factors', to form a circular business model canvas. The aim of the canvas is to support businesses in transitioning their business models from linear to circular. Circular value proposition is the most important component of the CBM, offering either a circular product, a circular product-service system or a circular service. All other components of the CBM may as well be adjusted for example in the form of virtualized channels; stronger customer relationships; new revenue streams from services and the sale of used items; use of inputs with lower environmental impact and inputs suitable for circularity; new key activities related to increasing performance, product design, remanufacturing and recycling; stronger partnerships; and changes in cost structure. (Lewandowski, 2016)

The additional 'take-back system' block considers the collection of used items, and their incentivised return and reuse. The channels, partners and customer relations related to take-back management are considered. The 'adoption factors' block, in turn, considers

both organisational capabilities and external factors. The former includes organisational culture, team motivation, knowledge and change management, and the latter, economic, political and technological issues, and sociocultural issues such as public opinion and customer behaviour. The author suggests conducting empirical research to verify the applicability of the framework in different business contexts. (Lewandowski, 2016)

Antikainen and Valkokari (2016), likewise, suggest additional dimensions to the original BMC based on previous studies on CE and sustainability, and other tools. They highlight the importance of system innovation and multilevel analysis, combining elements from both micro, meso and macro levels. They propose an additional dimension to analyse the business environment (trends and drivers) and stakeholder involvement, and another dimension to analyse the sustainability costs and benefits of the business model. They further include an element of continuous evaluation of sustainability and circularity of the business model. (Antikainen and Valkokari, 2016)

2.3.2. Circular business model types

Bocken et al. (2016), in the third most cited paper on circular business models, present design strategies and business models to support businesses in transitioning from linear to a circular economy. Strategies and models for both slowing and closing resource loops are presented, while strategies and models for narrowing loops, that is, resource efficiency, are excluded. Slowing resource loops refers to extending and intensifying the utilisation period of items through designing long-life items and extending product life through service loops, whereas closing resource loops refers to closing the loop between post-use and production through recycling. Stahel (1994, p.179) divided these as ‘reuse of goods’ and ‘recycling of materials’. The former results in a slower flow of resources, and the latter, in a circular flow of resources. Resource efficiency, instead, does not influence the speed of flow of resources and has been criticised for it; if the time dimension is not addressed, efficiency can lead to an even faster linear flow of resources. Narrowing can, however, be used in conjunction with slowing and closing the loop strategies and models. (Bocken et al., 2016)

In business models for slowing the loop, the value is retained at the product level, whereas in business models for closing the loop, it is retained at the material level (Lüdeke-Freund et al., 2019). Hence, the reuse of goods is both economically and ecologically preferred over recycling of materials (Stahel, 1994). Geyer, Kuczenski, Zink and Henderson (2015) also argue that as opposed to the idea of closed loops in CE, there is no remarkable difference between "open loop" and "closed loop" recycling when it comes to the environmental benefits, but rather, the benefits depend on the type and amount of material displaced. Interestingly, the findings of a systematic literature review on CE show that strategies for slowing the loop have been studied considerably less than strategies for closing the loop, 25 percent and 75 percent respectively. The authors suggest giving more attention to slowing the loop strategies in future research. (Merli et al., 2018). Similarly in practice, some aspects of CE such as recycling (closing) and energy efficiency (narrowing) have been advancing, while other aspects such as sufficiency and remanufacturing (slowing), have been less widespread (Lüdeke-Freund et al., 2019).

In addition to Bocken et al. (2016), circular business models have been classified by Tukker (2004) and Lacy and Rutqvist (2015). The five CBM types presented by Lacy and Rutqvist (2015) were identified based on a practical analysis of over 120 companies' innovative business models, and the ones by Bocken et al. (2016) and Tukker (2004), on previous literature and typologies. Later on, categorisations of the CBM types have been proposed by different authors, for example by Moreno et al. (2016) and Lüdeke-Freund et al. (2019). The following subchapters present the different CBM types leaning on the ones presented by Bocken et al. (2016), which are also summarised in table 1 at the end of the section. In addition, their connection to circular design strategies will be discussed, as according to Bocken et al. (2016), the conjunction of business models and design strategies is important.

Business models for slowing the loop

Business models for slowing the loop encourage long product life and product reuse. (Bocken et al., 2016). In the 'classic long life model', high-quality and long-lasting items are accompanied with repair, maintenance and reuse services. This model is closely

connected to circular design strategies, such as design for durability and repair. The premium pricing of the items covers the product guarantee and service costs. Luxury products are an example of the business model. ‘Encourage sufficiency’, similarly, comprises premium items and high level of services. It considers efforts aiming at reducing end-user consumption through repairability, upgradability and guarantees, and especially, through a non-consumerist approach to sales, promotion and marketing with no built-in obsolescence. The model specifically focuses on influencing and mitigating consumption (Bocken and Short, 2016). Sufficiency can be further encouraged by offering information on how to minimise impacts during use (Bocken et al., 2014). Again, the premium pricing justifies the fewer sales and a high level of services. For customers, however, it might be challenging to consider the future costs and benefits, and understand that the long life of a quality item offsets the premium price (Bocken and Short, 2016). Encouraging sufficiency may reduce resource consumption, while businesses can benefit from customer loyalty and premium margins. Patagonia, for example, operates a premium business model. (Bocken et al., 2016).

The ‘product life-extension’ model by Lacy and Rutqvist (2015) is in line with these types, seeking to recapture the value of items through quality, maintenance, repair and remanufacturing, and creating revenue through long product life instead of volume. The model includes six subcategories: creating durable products to last, refurbishing and remanufacturing used items, collecting used items for resell, upgrading items, refilling or replacing a function of a product, and repairing items. Companies can capture value by engaging with customers throughout the product life by offering services, this way also strengthening customer relationships. Networks with local service providers are usually needed to operate the model. An example is given from the clothing sector; trendy clothes are probably not suitable for product life-extension due to quickly changing consumer tastes, whereas basic clothes, like t-shirts, and classics are more so. (Lacy and Rutqvist, 2015).

In the ‘access and performance model’, service or capability is delivered instead of ownership. The user enjoys the service and performance, while the company takes over the maintenance. The services are priced per unit of service. This enables consumers to access

more expensive items as well (Bocken et al., 2014). The model can introduce financial incentives to slow the loop, such as increased profits for the company from durable items and reduced costs for the user from reduced use. This way, the need for physical items in total may be reduced. Examples of the model include hiring or leasing clothes, and laundrettes. (Bocken et al., 2016). This model pairs with the 'product as a service' model by Lacy and Rutqvist (2015), that is further divided into pay for use, leasing, renting and agreed performance. In the model, companies have an incentive to prefer durability and reusability over volume and disposability, while building stronger relationships with customers. (Lacy and Rutqvist, 2015). The 'sharing platform' model, instead, is centered around more intensive use of idle items through renting, lending, sharing or swapping, offering both companies and consumers new ways of making and saving money. The role of a company is to provide the platform for sharing. (Lacy and Rutqvist, 2015).

Finally, in the 'extending product value' model the residual value of an item is exploited by the manufacturer through remanufacture or repair, for example. The customers are offered a lower-priced, good as new item that has been repaired or remanufactured, ideally without the need for additional material consumption. Take-back systems and collaboration with logistic companies are needed to enable product returns. The take-back collection is usually incentivised offering the customer additional value as part of the value proposition (Lewandowski, 2016). While the logistics and labor costs may be increased, the reduction in material costs can lead to decreased overall costs for the company. Ideally, manufacturers themselves create business models supporting reuse, whereas 'gap exploiters' exploit the residual value of other companies' items. Clothing return initiatives are an example of the model. (Bocken et al., 2016).

Design strategies closely linked to the slowing the loop models are 'design for durability' and 'design for ease of maintenance and repair'. The former refers to designing products to take wear and tear, material selection being in a major role, and the latter to designing products that can be easily maintained or repaired in a good condition. Interestingly, the connection between the long life models and 'design for attachment and trust' is not discussed specifically. Highlighting the connection would make sense as another term used for 'design for attachment and trust' is 'design for emotional durability', referring to a

situation where users form long-lasting partnerships with their favourite items. Other design strategies for slowing the loop include for example ‘design for upgradability and adaptability’. (Bocken et al., 2016)

Product-service systems

While CBM research in general is rather recent, product-service systems, a type of CBMs, have been more extensively studied. They widely correspond to the slowing the loop business models presented in the previous subchapter. PSSs aim at replacing material intensive ways of consumption by shifting from offering products to offering services (Mont, 2002). According to Tukker (2004, p.246), product-service systems are “tangible products and intangible services designed and combined so that they jointly are capable of fulfilling specific customer needs”. Originally the concept was proposed by Stahel (1994) in order to support the transition towards a more sustainable economy (Tukker, 2004). Despite being considered effective in moving towards CE, PSSs have not been widely implemented, especially in the B2C markets (Tukker, 2015).

PSSs are divided into ‘product-oriented services’, ‘use-oriented services’ and ‘result-oriented services’. In the first, services are offered in addition to selling items, in the second, items are made available for the user but the ownership stays with the provider, and in the third, a result is provided to the user instead of a specific item. Services offered to the customer in the product-oriented PSS include maintenance, take-back and consultancy services. In the use-oriented PSS, products are made available through renting, sharing, leasing or pooling. (Tukker, 2015). For companies, PSSs mean taking responsibility for the whole life cycle of an item (Mont, 2002). While more capital is usually needed to set up a PSS, additional value can be captured through attracting new customers, increased customer loyalty and improved innovation potential. (Tukker, 2004). For users, PSSs mean less responsibility, but more effort is needed to get access to the service, especially in the case of use-oriented services (Tukker, 2015). Besides, users typically value freedom and having control over things (Tukker, 2015), and renting items does not contribute to self-esteem like owning does (Tukker and Tischner, 2006).

As PSSs shift from selling items to selling services, they offer the opportunity to decouple economic growth from material consumption (Franco, 2019). The smaller total amount of products needed due to more intensified use may result in resource efficiency and smaller environmental impact (Mont, 2002). While all types of PSSs have the potential to extend product life and minimise resource use throughout the product's life cycle, they do not necessarily lead to reduced resource use. (Kjaer, Pigosso, Niero, Bech and McAloone, 2019). In product-oriented services, there might be minor efficiency improvements due to better maintenance, for example, but the interest in maximising product sales might not change. Use-oriented services can create major positive impacts if the biggest impact is related to the production of the item, and not to use. Even more so if they manage to decrease the need for use. (Tukker, 2004). The result-oriented services have the biggest potential for sustainability improvements (Tukker, 2004), but require most changes in a company's business model (Tukker, 2015).

Business models for closing the loop

Business models for closing the loop by Bocken et al. (2016) are 'extending resource value' and 'industrial symbiosis'. The former refers to creating value out of waste materials. Items that exploit the residual value of resources may be more appealing to "green" customers and the price may be lower due to reduced material costs. Take-back systems and collaborations are needed to collect the materials. Gap exploiters create value by exploiting other companies' waste materials, but ideally, again, resource reuse is done by the manufacturer itself. By using waste to create value, the demand for primary resources and the amount of waste ending up in landfills may be reduced (Bocken et al., 2014). The latter, 'industrial symbiosis', stands for using waste outputs from one process as an input for another process. It usually considers a network of businesses located close to each other that can collaborate to exchange by-products from processes and to reduce operating costs and risks. In addition to cost reductions, value can be captured by creating new business lines from the waste streams. Design strategies for closing the loop include 'designing for a technical cycle', 'designing for a biological cycle', and 'designing for disassembly or reassembly'. (Bocken et al., 2016).

The ‘recovery and recycling’ model by Lacy and Rutqvist (2015) corresponds to the models by Bocken et al. (2016). The model can be divided into recovering end-of-life items to create value, and recovering by-products and waste from production and processes to create value, either the company’s own or another company’s. In zero waste operations, the residual material from one product or process serves as a resource for another. The model also creates value for customers by offering them an incentivised and convenient method of disposal. Worth noting is that while the material costs may be lower due to using secondary resources, this is not always the case, and depends on the material properties and quality. Examples of the model include a carpet manufacturer Interface that uses discarded nylon fishing nets from the ocean to manufacture new carpet tiles. Also the ‘circular supply-chain’ model falls under business models for closing the loop. In the model, recyclable, biodegradable or renewable materials are used over linear inputs to increase control and predictability, and decrease costs. (Lacy and Rutqvist, 2015).

The value proposition, value creation and delivery, and value capture of each CBM type presented by Bocken et al. (2016) is mapped in the following table 1. The authors state that hybrid-forms and sub models of the business model types are possible, and suggest developing combinations or creating completely new forms in future research. Further they suggest case studies to test the identified business models. The archetypes presented by Lacy and Rutqvist (2015) can likewise be implemented alone or as a combination. For example, according to a study by Rattalino (2018), the clothing company Patagonia employs a combination of the ‘circular supplies’, ‘resource recovery’ and ‘product life extension’ models by Lacy et al. (2014). As argued by Pieroni et al. (2019), however, the various suggestions for CBM archetypes may hinder the consolidation of knowledge.

Table 1. Circular business model types. Drawn from Bocken et al. (2016).

Circular business model	**Value proposition**	**Value creation and delivery**	**Value capture**
Classic long life	High-quality and long-life items, high level of services	Durable product design, repair and maintenance services	Premium pricing covers the guarantee and service costs
Encourage sufficiency	High-quality and	Durable design and	Premium pricing

	long-life items, high level of services, no built-in obsolescence	services, non-consumerist approach to sales	justifies fewer sales and high service level
Access and performance	Delivery of service instead of ownership	Service and maintenance taken over by the company, user enjoys the performance and access to the service	Pricing per unit of service, additional costs covered by additional revenues
Extending product value	Affordable, as good as new product through repair or remanufacturing	Take-back systems and collaborations to ensure product returns, repairing and remanufacturing	Reduced material cost, potentially increased labor and logistics costs, overall costs possibly lower
Extending resource value	Exploiting the residual value of resources, more appealing items to "green" customers, lower product price	Take-back systems and collaborations to collect materials	Value from waste resources, lower material costs and product price
Industrial symbiosis	Using outputs from one process as feedstock for another process, reduced costs and risks for the business network	Collaboration to reduce costs and exchange by-products	Joint cost reductions, new business lines from waste streams

2.3.3. Drivers, enablers and challenges

The implementation of CE for companies, and the related challenges, have been only narrowly discussed in previous literature (de Jesus and Mendonça, 2018; Franco, 2017; Lieder and Rashid, 2016; Rizos et al., 2016; Urbinati et al., 2017). Indeed, the research and empirical examples on the drivers and barriers for implementing CBMs are limited (Tura et al., 2019). de Jesus and Mendonça (2018, p.77) define these drivers as "factors that enable and encourage the transition to a CE", and barriers as "technical/financial impediments or regulatory/cultural bottlenecks that obstruct transitions towards a CE". Developing a proper understanding of the barriers especially is important to support the circular transition (de Jesus and Mendonça, 2018). According to an empirical study by Tura et al. (2019), the drivers and barriers are highly context-specific, meaning that companies need to carefully analyse their business environment when designing CBMs. Similarly de Jesus and Mendonça (2018) found that companies typically face a mixture of different drivers and barriers that are related to the local settings.

To start with the drivers and enablers, de Jesus and Mendonça (2018), in a literature review of both academic and non-academic papers, identified economic, institutional and social factors as the biggest drivers. The economic drivers include the need to decouple revenue creation from material input and the need to increase performance, while the institutional drivers include supportive policy measures. The social factors, in turn, include a supportive environment for circular innovations and shifting customer preferences towards circular offerings. Similarly, a study examining drivers, challenges and opportunities for sustainable business model innovation in the textile industry specifically, identified increased consumer awareness on sustainability and conscious consumption trends as major drivers. In addition, collaboration was identified as a driver. Cooperation between different stakeholders in the value network, such as suppliers, customers and even competitors, allows the sharing of knowledge, best practices and resources, this way being critical for smaller businesses especially. (Todeschini, Cortimiglia, Callegaro-de-Menezes and Ghezzi, 2017)

Additionally, in a case study of 30 circular small and medium-sized enterprises (SMEs), the company's environmental culture, that is, the commitment and mindset of the management and employees, was identified as the biggest enabler for CBM implementation. It was noted that for start-up companies, adapting CE principles is rather easy as the company culture can be created from scratch. Other enablers identified were networking and information sharing with other SMEs; demand network support, that is, customers valuing green products and services; financial attraction such as special funds to start-ups and circular solutions; and recognition in form of prizes and awards, for example. Also individual know-how and governmental support were mentioned. Hence, a variety of enablers exist to support companies in implementing CBMs and overcoming the barriers. (Rizos et al., 2016)

The same study identified the biggest barrier for CBM implementation to be related to the supply and demand networks of a company. More precisely, the lack of “green” suppliers, and the lack of support from customers that would still need to be convinced of the benefits of circular products and services. Another major barrier identified was the lack of capital,

including both the lack of initial capital and access to finance, and the lack of human and time resources to develop green products and services. Similarly, de Jesus and Mendonça (2018) identified the lack of finance to support circular innovations as a specific challenge for SMEs. Other barriers were related to governmental support, such as lack of effective legislation; to administration, such as complex certification procedures and standards; and to technical know-how, such as lack of skills and knowledge on circular practices. The lack of information and the company's environmental culture were also named. (Rizos et al., 2016). In addition, Vermunt et al. (2019) identified the lack of examples of successful CBM implementation and the lack of awareness of CE on a societal level as barriers, and de Jesus and Mendonça (2018), technical factors, such as the unavailability of technical solutions and technical innovation.

In the study by Todeschini et al. (2017), the identified challenges in the context of textile industry include rethinking the design phase, as decisions made in the design phase affect the whole business model, creating a supply network with shared values, and educating consumers on the benefits of sustainable products and services. The results of the study indicate that sustainable business model innovation in the textile sector differs a lot between incumbent firms and 'born sustainable' startups. The values of these startups are aligned with social and environmental sustainability, and their flexibility supports business model innovation. (Todeschini et al., 2017). Similarly Guldmann and Huulgaard (2020), in a case study of 12 Danish companies on barriers for CBM innovation, found that start-up companies, as opposed to incumbents, did not encounter barriers at the employee level, such as lack of knowledge or organisational lock-in. All in all, small companies were found to experience less internal barriers than large companies. Other than that they found that the barriers encountered are related to other factors than industry, company size and customer segments. These can be for example the company's internal setting, stakeholders and ambition level. Moreover, the CBM type might play a role as some types require changes to all or almost all business model components and thus, may come with a higher number of barriers.

Finally, the most cited paper on the topic, a literature review and a single case study on challenges in innovating remanufacturing and reuse-based business models by Linder and

Williander (2017), found that many of the challenges can be overcome in practice. The challenges identified from previous literature included customer type restrictions, need for technical expertise, return flow and product type challenges, fashion vulnerability, risk of cannibalizing own sales, tied up capital, operational risks, lack of supportive policies, and partner restrictions. Vermunt et al. (2019), in their study on barriers to CBM implementation, also examined ways to overcome the barriers. These include creating awareness on CE, and establishing close relationships with suppliers and supporting them in becoming circular. Bressanelli, Perona and Saccani (2019) likewise suggest awareness creation, closer relationships with suppliers, and knowledge development to overcome the challenges. Importantly, collaboration, and knowledge- and resource sharing between businesses, academia and government is needed to lower the barriers (de Jesus and Mendonça, 2018; Tura et al., 2019).

In a recent paper by Tura et al. (2019), a framework with seven different categories of drivers and barriers to implementing circular business models was created. The categories were formed based on a literature review and a case study of four multinational companies. These categories with the exclusion of category 'environmental' are used to summarise the drivers, enablers and challenges for implementing CBMs in table 2 below. The exclusion was made as nothing was found under the category from the other reviewed papers.

Table 2. Drivers, enablers and challenges for CBM implementation. Framework of categories from Tura et al. (2019), findings from reviewed literature.

Category	**Driver/enabler**	**Challenge**
Economic	Funds for start-ups and circular solutions *(Rizos et al.)*, Potential for cost reduction and stability *(de Jesus and Mendonça)*, Need to decouple revenues from resource consumption *(de Jesus and Mendonça)*, Need to increase performance *(de Jesus and Mendonça)*	Lack of capital and access to finance *(de Jesus and Mendonça; Rizos et al.)*, High initial investment costs *(de Jesus and Mendonça)*, Uncertain return and profit *(de Jesus and Mendonça)*, Tied up capital *(Linder and Williander)*, Risk of cannibalisation *(Linder and Williander)*
Social	Awareness on sustainability issues *(de Jesus and Mendonça; Todeschini et al.)*,	Lack of support from demand networks *(Rizos et al.)*, Lack of social awareness and

	Consumer trends and shifting preferences *(de Jesus and Mendonça; Todeschini et al.)*, Customer demand for green products and services *(Rizos et al.)*, Prizes and awards *(Rizos et al.)*, Sensitivity to environmental problems, reputational gains *(de Jesus and Mendonça)*	uncertain consumer needs *(Todeschini et al.)*, Lack of clear incentives *(de Jesus and Mendonça)*, Rigidity of consumer behaviour and businesses routines *(de Jesus and Mendonça)*, Customer type restrictions *(Linder and Williander)*, Fashion vulnerability *(Linder and Williander)*
Institutional	Supporting funds, taxation and subsidy policies *(Rizos et al.)*, Public policy measures, supporting environment for innovation *(de Jesus and Mendonça)*, Environmental legislation and standards *(de Jesus and Mendonça)*	Lack of governmental support and effective legislation *(de Jesus and Mendonça; Linder and Williander; Rizos et al.)*
Technological and informational	Technological innovation *(de Jesus and Mendonça; Todeschini et al.)*, Individual know-how *(Rizos et al.)*	Lack of information and knowledge *(Rizos et al.)*, Lack of technological knowledge and availability of technical solutions *(de Jesus and Mendonça; Linder and Williander; Rizos et al.)*
Supply chain	Networking and information sharing with other SMEs *(Rizos et al.)*, Cooperation with different actors along the supply chain *(Todeschini et al.)*	Lack of support from supply network *(Rizos et al.)*, Return flow challenges *(Linder and Williander)*
Organisational	Company environmental culture *(Rizos et al.)*	Company (environmental) culture *(Rizos et al.)*, Lack of resources for green development *(Rizos et al.)*, Administrative burden *(Rizos et al.)*

2.4. Circular economy in the textile and clothing industry

In this chapter, the discussion on circular economy and circular business models is brought to the specific context of the study, to the context of clothes and textiles. Clothes, indeed, have a significant role in almost everyone's life providing protection, comfort, and offering a means to express oneself. The industry worth 1.3 trillion USD provides employment for more than 300 million people around the world. The current clothing system, however,

operates in an almost completely linear way, causing various negative social and environmental impacts. The social challenges are related to poor working conditions, including insufficient safety and health procedures, forced and child labour, excessive working hours and wages below a living wage (Fontell and Heikkilä, 2017). The environmental impacts are related to high energy, water and chemical use in the production, and waste creation (Pal and Gander, 2018). For example, in 2015 textile production was estimated to be responsible for 1.2 billion tonnes of greenhouse gas emissions, which is more than the emissions by international flights and maritime shipping together. The share of clothing from the total textile use is above 60 percent. (EMF, 2017)

The business models in the textile and clothing industry typically are characterised by high volumes of production and sales (Niinimäki and Hassi, 2011). In the fast fashion business model, supply chains are streamlined and costs minimised, making it possible to offer affordable clothing and introduce new collections often (Koszewska, 2018). The low prices encourage buying more and wearing a single item less frequently (Niinimäki et al., 2020). The fast fashion cycles create new consumer needs, making the industry a great example of the existence of planned obsolescence (Niinimäki and Hassi, 2011). Indeed, the amount of clothes produced has approximately doubled in the last 15 years, and the number of times a single item is used has decreased by 36 percent on a global average (EMF, 2017). The frequent replacement and increasing amount of textile waste create environmental burden (Niinimäki and Hassi, 2011). The end-of-life options for clothing are reuse, recycling, incineration and landfill disposal. However, the reuse potential for low-value clothing is poor due to the low quality and going out of fashion. EMF (2017) estimates that only 13 percent of the materials used for clothing are recycled some way after use, many of them to lower-value applications, and less than one percent into new clothing. For example in Finland in 2012, 80 percent of used textiles ended up in energy production, and only 20 percent were collected for reuse, out of which the majority were exported and only around 1,5 percent were recycled (Dahlbo, Aalto, Eskelinen and Salmenperä, 2017). This results in a huge loss of raw materials and energy (Koszewska, 2018).

The current linear model characterised by large amounts of resource extraction and short use phases cannot continue as it is, especially with the growing population and middle

class (Koszewska, 2018). EMF (2017) estimates that if the demand for clothing would continue to grow as expected, the total amount of sales would be more than three times bigger in 2050 than today. Moving from the linear to a circular model is seen as a solution for mitigating the sustainability challenges of the current textile system (Koszewska, 2018; Niinimäki et al., 2020; Pal and Gander, 2018). EMF (2017), in the report *A new textiles economy: Redesigning fashion's future,* proposes a vision for a circular textile economy. In the system, the value of clothes and materials is kept at their highest during use, and after use they are fed back into the system instead of ending up as waste. Substances of concern and microfibre release are phased out, clothes are designed and used to be nondisposable, textile recycling is improved, resources are used efficiently and renewable resources are preferred. The system is set to provide benefits for both the environment, businesses and society. A systemic approach and collaboration between different parties are needed to transform the industry from linear to circular. High quality clothes and new business models are in the center of the vision as the most effective way to design out waste and pollution is to increase the number of times garments are worn. Similarly in Finland, The Relooping Fashion Initiative has modelled a *circular business ecosystem for textiles* that involves different CBMs along the value cycle focusing on repair and maintenance, product reuse, material reuse and recycling activities (Fontell and Heikkilä, 2017).

Truly, to realise a CE in the clothing sector, new business models based on circularity and sustainability are needed (Niinimäki et al., 2020; Pal and Gander, 2018; Todeschini et al., 2017). Circularity can be implemented in business models for example through increased product attachment, access-based consumption, repair and reuse services, and material recycling (Bocken et al., 2019; Niinimäki et al., 2020; Pedersen, Earley and Anderson, 2019). Born-sustainable start-ups especially often create unique value propositions by combining different methods for implementing sustainability and circularity in their business models (Todeschini et al., 2017). These new business models have started to emerge as a response to the vast sustainability challenges of the current textile system (Pal and Gander, 2018; Pedersen et al., 2018). Collaboration between different actors and stakeholders is necessary in the new business models (Heikkilä, Fontell, Määttänen and Harlin, 2018), and a new mindset and change in both production and consumption patterns are required (Niinimäki and Hassi, 2011). Consumers play a key role in the success of the

models, hence, companies need to build long-term relationships with their customers (Pedersen et al., 2019), educating, communicating, engaging and motivating them to participate in a circular fashion system (Kant Hvass and Pedesen, 2019).

Slowing the loop

As one of the main principles of CE is to keep items and materials in use for as long as possible (Fontell and Heikkilä, 2017), high-quality, circular product design is required (Heikkilä et al., 2018). Items made for long-term use need to be durable, timeless and well-fitting. (Koszewska, 2018). The physical durability of items can be increased by using durable materials, seams, dyes and prints, and the emotional durability for example by involving users in the maintenance of the item. Moreover, clothes can be designed for adaptability, and the life span can be further lengthened through modification and upgrading services (Niinimäki and Hassi, 2011). Other things to support the long life include warranties, repair services, and enhanced care instructions. Extensive warranties demonstrate a high commitment to quality and offer valuable data for brands on their items. Repair services can be offered in-house or in collaboration with local service providers. (EMF, 2017).

High quality and durability are also prerequisites for clothing PSSs, a possible solution to extend product life in the clothing sector. Traditionally, the industry is very much product-oriented, even though services have long existed to support the maintenance of items. Other than repair and maintenance, services aiming at promoting sustainability, such as clothes rental and take-back, have started to increase. By combining clothes with services to extend product life, companies can create new offerings and additional revenue. (Armstrong et al., 2015). Previously, rental services have focused on special occasion wear and workwear but today, opportunities for new types of rental and leasing services, also for everyday wear, exist (Fontell and Heikkilä, 2017). Short-term rental allows low-usage garments to be used more frequently. Customers can benefit from gaining access to more expensive items and having frequent changes in their outfit. However, convincing is still needed to make clothes rental more attractive to customers (EMF, 2017), even though collaborative consumption has started to gain ground, especially among younger

consumers (Armstrong et al., 2015). Challenges related to consumer acceptance of use-oriented PSSs include concerns with availability, price and hygiene, and the lack of ownership as in the clothing sector especially, the products are tightly connected to self-expression (Armstrong et al., 2015).

In addition, the increased quality of items provides opportunities for clothing reuse and value capture through resale (EMF, 2017). Brands themselves have started to introduce take-back and reuse services, and provide platforms for second-hand items in stores and online (Fontell and Heikkilä, 2017; Kant Hvass, 2014; Stål and Corvellec, 2018). This way, brands offer a convenient alternative for their customers and participate in mainstreaming clothing reuse (EMF, 2017). It is common that the return of used items, either for recycling or resale, is rewarded with a discount coupon. The incentivised return has also been criticised as it can be seen as a marketing activity aiming to encourage customers to make new purchases rather than aiming at true material circulation (Stål and Corvellec, 2018).

Slowing the loop in the clothing industry reduces the amount of production and waste, thereby creating positive environmental impacts (Pal and Gander, 2018). It is estimated that if the times a piece of garment is worn were doubled, greenhouse gas emissions would decrease by 44 percent on average (EMF, 2017). If repair and reuse are encouraged, environmental benefits can be generated through decreased production of new clothing (Zink and Geyer, 2017). Also, sharing items that are used only rarely could decrease the demand for new items (Todeschini et al., 2017). PSSs can contribute to dematerializing consumption and decreasing resource reliance (Armstrong et al., 2015). Pal and Gander (2018) argue, however, that the slowing the loop models have a limited potential to reduce consumption, and the environmental impacts accordingly, as they remain in a niche role. These new models should be widely adopted within the industry to shift the current unsustainable production and consumption paradigm, and not only add to the existing models. (Pal and Gander, 2018). While the increased quality and longevity of the items can increase customer satisfaction, consumers that are used to consuming fashion items frequently, might resist the transformation of their habits. (Armstrong et al., 2015). On the other hand, according to a study by Niinimäki and Hassi (2011), approximately 80 of the

Finland-based respondents stated to be ready to acquire long-lasting, repairable and more expensive pieces of clothing to positively contribute to the environmental impact.

Closing the loop

By reusing and recycling textiles and materials that would otherwise be considered waste, the need for virgin materials and other resources in clothing production can be reduced (Dahlbo et al., 2017; Todeschini et al., 2017). Clothing reuse is the preferred option for items that are in good condition, followed by material reuse (Fontell and Heikkilä, 2017). The latter can be used for clothing and textiles that are no longer reusable as such, but have good quality materials. Usually, these clothes and materials are sourced from companies with large amounts of textiles, for example second-hand operators (Fontell and Heikkilä, 2017), or they can be complete pieces of fabric such as leftover materials (EMF, 2017). While this type of reuse has a lot of growth potential, (Fontell and Heikkilä, 2017), it is labour intensive and the material supply can be limited (EMF, 2017). Finally, when the clothes and materials are no longer suitable to be used as such, they should be recycled into raw materials for new textiles (Fontell and Heikkilä, 2017).

Pre- and post-consumer textile waste can be recycled in a mechanical or chemical process (Niinimäki et al., 2020). However, the recycling process is challenging due to the common use of material blends, that is, different types of fibres such as cotton and polyester being blended together (Franco, 2017; Niinimäki et al., 2020), and the use of toxic chemicals in garment dyeing and finishing (Jia, Yin, Chen and Chen, 2020). While material blends may come with advantages related to quality, performance, comfort and cost, the recycling process gets challenging as the current technologies are unable to separate the different fibres (EMF, 2017; Franco, 2017). New design approaches consider the future recyclability of items by, for example, using mono-materials only. This, however, may sometimes contradict with the aim of increasing product durability. (Pal and Gander, 2018). Closing the loop in the textile industry on a large scale, and the environmental benefits thereof, await technological innovation capable of processing a large variety of materials (Niinimäki et al., 2020; Pal and Gander, 2018). Today, most of the materials used for

textiles are downcycled to lower value purposes such as fillings, insulation materials and cleaning towels. (EMF, 2017; Franco, 2017; Fischer and Pascucci, 2017).

Brands have an important role in stimulating the demand for recycled materials by increasing the amount of recycled materials in their collections, but the lower quality and higher prices of the materials limit their application. Most of the recycled materials used in clothing production today come from waste materials from other industries, for example recycled polyester being made of recycled PET bottles. By using recycled materials the use of virgin materials can be reduced, and the negative impacts accordingly. However, the use of recycled materials from other industries could suppress closed-loop recycling in those industries and in the textile industry alike. (EMF, 2017). For example, Pal and Gander (2018, p.255) argue that "the more closed the loop is, the more efficient the resource use will be". In addition, while the chemical recycling processes are still being developed, some companies, including Pure Waste Textiles, already recycle cotton mechanically to produce new fabrics and items. Challenges in mechanical recycling are related to the quality and length of the fibres. This can be tackled for example by using pre-consumer textile waste and mixing recycled fibres with virgin ones. (Fontell and Heikkilä, 2017).

CE truly is becoming a major topic in the textile industry. As a part of the Circular Economy Action Plan, a comprehensive EU Strategy for Textiles will be proposed in 2021. The strategy aims to boost the market for circular and sustainable textiles and textile reuse, strengthen innovation and competitiveness, and drive new business models. To achieve these objectives, a sustainable product framework will be proposed to ensure fit for circularity and the use of secondary raw materials, and to empower consumers to choose sustainable products, and businesses to make repair and reuse services widely available. The business and regulatory environment will be improved by supporting and incentivising service-based business models, and circular materials and production processes. Further, textile sorting, reuse and recycling will be promoted, for example through regulations such as extended producer responsibility. (European Commission, 2020)

2.5. Literature review summary and theoretical framework

To summarise the reviewed literature, circular economy and circular business models indeed are seen as an important solution for targeting the environmental sustainability challenges of today, while creating opportunities for economic value creation. Despite the increasing attention, the implementation of CBMs has been slow. The transition from a linear to a circular economy requires companies to rethink the way they create, deliver and capture value. Circularity can be implemented in business models through slowing, closing and narrowing the loop, that is, through reusing, recycling and resource efficiency. The two former are prioritised by the authors, and reuse is seen as the environmentally and economically preferred option. CBM types have been proposed by Bocken et al. (2016), Lacy and Rutqvist (2015), and Tukker (2004). Various drivers, enablers and challenges are related to the implementation of CBMs. They are related to economic, social, institutional, technological and informational, supply chain, and organisational factors. They are found to be context specific and for example, start-ups and small companies are often found to encounter less challenges. The current linear model in the textile and clothing industry, characterised by high production volumes, short use phases and huge amounts of waste, is behind the industry's many sustainability challenges, especially the vast environmental impacts. A circular textile economy with circular business models is seen as an important solution. Long-life items, repair, rental and reuse services, and material recycling are methods to implement circularity in the textile business models.

The theoretical framework I propose in this thesis is built on the CBM types developed by Bocken et al. (2016). The 'industrial symbiosis' model is excluded as I study the CBM types of single companies and not networks of companies. Instead of using the more detailed business model mapping tool, the Business Model Canvas by Osterwalder and Pigneur (2010), the key business model elements are mapped simply under 'value proposition', 'value creation and delivery' and 'value capture', similar to Bocken et al. (2016), and to Richardson (2008), for example. In addition, elements from the circular business model canvases proposed by Lewandowski (2016) and Antikainen and Valkokari (2016) are included in the form of an additional dimension for mapping the adoption factors and the trends and drivers. These are divided into 'adoption factors: drivers and

enablers' and 'adoption factors: challenges', and the categories are drawn from Tura et al. (2019). The framework presented in figure 3 below, will be used in categorising, mapping and analysing the empirical findings.

Circular business model	**Value proposition**	**Value creation and delivery**	**Value capture**
Classic long life	High-quality and long-life items, high level of services	Durable product design, repair and maintenance services	Premium pricing covers the guarantee and service costs
Encourage sufficiency	High-quality and long-life items, high level of services, no built-in obsolescence	Durable design and services, non-consumerist approach to sales	Premium pricing justifies fewer sales and high service level
Access and performance	Delivery of service instead of ownership	Service and maintenance taken over by the company, user enjoys the performance and access to the service	Pricing per unit of service, additional costs covered by additional revenues
Extending product value	Affordable, as good as new product through repair or remanufacturing	Take-back systems and collaborations to ensure product returns, repairing and remanufacturing	Reduced material cost, potentially increased labor and logistics costs, overall costs possibly lower
Extending resource value	Exploiting the residual value of resources, more appealing items to "green" customers, lower product price	Take-back systems and collaborations to collect materials	Value from waste resources, lower material costs and product price
Adoption factors: drivers and enablers Economic, Social, Institutional, Technological and informational, Supply chain and Organisational drivers and enablers		**Adoption factors: challenges** Economic, Social, Institutional, Technological and informational, Supply chain and Organisational challenges	

Figure 3. Theoretical framework.

3. Research design and methods

In this chapter, the research design and methods of the thesis are explained. First, the research approach will be discussed including the chosen philosophical position and research strategy. Next, the background for data collection and the data collection process will be explained, followed by the explanation of the data analysis process. Finally, the trustworthiness of the research and ethical considerations will be discussed.

3.1. Research approach

I chose a qualitative approach for the study as it offers the opportunity to understand business-related phenomena in real-life contexts and produce knowledge about them. Qualitative approach is flexible and exploratory, making it suitable for studying phenomena with modest prior insights. (Eriksson and Kovalainen, 2011). According to for example Pieroni et al. (2019) and Rosa et al. (2019), the business related phenomenon in question in this study, the circular business models implementation, has not been extensively studied previously. The same applies to the slowing the loop business models (Merli et al., 2018), to the implementation drivers and challenges (Rizos et al., 2016), and to the context of textiles and clothing specifically (see, e.g. Kant Hvass and Pedersen, 2019; Rattalino, 2018).

Moreover, I chose critical realism as my ontological and epistemological starting points for the study. While ontology aims to answer the question “what is there in the world”, epistemology aims to answer the questions “what is knowledge and what are the sources and limits of knowledge” (Eriksson and Kovalainen, 2011, p.14). Critical realists agree with realists that a “real world” exists outside the knower. In the realist view, “a person’s perceptions are a window to that blurry, external reality” (Sobh and Perry, 2006, p.1199). The reality can be imperfectly understood, but using triangulation enables getting closer to that reality. The findings are considered to be probably true in the realist epistemology. (Healy and Perry, 2000). Critical realists, however, draw additionally from social constructionism, acknowledging that “knowledge about the world is socially constructed” (Eriksson and Kovalainen, 2011, p.19). In the study, I assume that reality exists

independently outside me as a researcher, however, me and the research participants are part of the knowledge production process. Perceptions and experiences may affect knowledge creation.

This study is framed as a case study. Case study is a suitable strategy for studying real-life phenomena, and for looking at answers to "how" and "why" questions (Yin, 2003, p.1). Thus, the strategy fits well with the main research question of the study, *how do Finnish manufacturing clothing companies implement circularity in their business models*. Case studies are considered to be able to present complex business related topics in an approachable way (Eriksson and Kovalainen, 2011). Detailed and holistic knowledge production, based on multiple and rich empirical sources, is emphasised in various case study definitions (Tellis, 1997 cited in Eriksson and Kovalainen, 2011). With the results of a case study, something can be said about the studied phenomenon, at least in a specific context (Eriksson and Kovalainen, 2011).

Central in all case studies is "the construction of 'the case' or several 'cases'" (Eriksson and Kovalainen, 2011, p.115). The research questions aim at solving and understanding the case, the purpose being to study the case in its economic, social, cultural, technological and historical context (Eriksson and Kovalainen, 2011). Yin (2003, p.23) argues that "the "case" also can be some event or entity that is less well defined than a single individual", for example, "decisions, programs, the implementation process, and organizational chance". This study could be framed as an embedded single case study, in which the phenomenon of *circular business model implementation* is the case that is studied through multiple embedded units of analysis (subunits), that is, through multiple Finnish manufacturing clothing companies. Hence, the focus is on circular business model implementation, and not on the companies per se. However, attention is given to the subunits and quantitative analyses can be included, as described in Yin (2003). An embedded single case study with multiple units of analysis is an alternative to a holistic single case study with only one unit of analysis (Yin, 2003).

Moreover, the study has similarities to an extensive case study that "aims at elaboration, testing or generation of generalizable theoretical constructs by comparing (replicating) a

number of cases" (Eriksson and Kovalainen, 2011, p.118). Each unit of analysis, in my study, each subunit, increases the knowledge on the studied case. The aim is to map patterns across the subunits to develop and elaborate existing theory, that of circular business models. As is typical in extensive case studies, all features of subunits are not studied and analysed in detail as they are not the focus of interest, the studied phenomenon is. (Eriksson and Kovalainen, 2011). Finally, in case studies, also quantitative evidence can be used (Yin, 2003). The empirical findings of my study include some quantitative elements due to the high amount of subunits.

3.2. Data collection

The starting point for the data collection was FINIX's *#kestävävaate* (sustainable clothing) campaign's list of pioneering Finnish textile companies that was first published in April 2020, after which, updated regularly. The list was set up in the beginning of the COVID-19 pandemic with the aim to support Finnish companies that are creating sustainable and circular economy -based ways of consuming textiles in the challenging time to reach the attention of consumers in the online market. These pioneering companies are needed in moving towards sustainable, and circular economy -based textile production and consumption. The companies were listed and evaluated by FINIX researchers according to the following criteria: *significant use of recycled and leftover materials; repair service/guarantee; take-back system for used clothing; rental service; plan and action to ensure product longevity; manufacturing in Finland; manufacturing in the Baltic or Nordic countries;* and *supply chain explained.* The first five criteria, consisting of different circular economy implementation methods, were the main criteria, while the three latter were supportive ones (FINIX, 2020a). The evaluation was done based on the information given on a company's webpage. As a research assistant in the FINIX project, I participated in evaluating the companies, having a small role in the compilation of the list.

The list consists of companies that were previously familiar to the researchers, and of companies that were suggested to be included in the list either by the company representatives themselves or by customers and other stakeholders. The campaign was made visible for example by being shared by Finnish news agencies. To be included in the

list at least one of the following criteria needed to be met: *significant use of recycled and leftover materials; take-back system for used clothing; rental service* and *plan and action to ensure product longevity,* while the other criteria, *repair service/guarantee; manufacturing in Finland; manufacturing in the Baltic or Nordic countries;* and *supply chain explained,* needed to be coupled with at least one additional criteria. Further, the focus was on smaller companies and a rough yearly revenue limit was drawn to 5 million euros. (FINIX, 2020a). It can be expected that the list includes the majority of the Finnish companies that meet the campaign criteria. Hence, studying the companies on the list more thoroughly was considered valuable for the FINIX project.

The version of the list that I used as the basis for data collection was from the 18th of June 2020, including a total number of 95 companies. From these companies, I excluded second-hand stores, care, repair and maintenance companies, marketplaces, textile recyclers, and clothing libraries. Further, companies manufacturing household textiles, fabrics or bags and other accessories solely were excluded. After the exclusions, the list consisted of 65 manufacturing clothing companies, the ones in the focus of this study. These companies are the embedded units of analysis, the subunits.

In data collection, I used both secondary and primary data collection methods. Secondary data refers to "empirical data that exist somewhere already", while primary data is "empirical data collected by researchers themselves" (Eriksson and Kovalainen, 2011, p.77). I collected secondary data from the listed companies' web pages and primary data by interviewing a number of these companies. Using multiple sources of data, triangulation of data, is typical in case studies, (Yin, 2003), and considered more "accurate, convincing, diverse and rich" (Eriksson and Kovalainen, 2011, p.126). According to Eriksson and Kovalainen (2011), in a good case study, alternative perspectives are considered by examining evidence from more than one perspective. This can be achieved through triangulation.

To answer the first research question, *how do Finnish manufacturing clothing companies implement circularity in their business models*, I collected circular economy related information from the companies' web pages. I chose this method for data collection as the

companies were evaluated and included in the list based on the information they give on their web page. In the *#kestävävaate* campaign's web page, it is stated that "what consumers know about the sustainability of a company, is what the company tells", and for example that "it [repair service] exists for the consumers only when it is openly communicated in the web page with the conditions" (FINIX, 2020b). Also, texts are considered to represent the studied topic directly and transparently (Eriksson and Kovalainen, 2011). Further, I considered the data collection method suitable for studying such a large number of companies. I conducted the data collection during June and August 2020 by visiting each of the 65 companies' web pages twice and drawing all the related information in an Excel sheet for the purposes of data analysis.

However, to examine the first research question more thoroughly, to better understand how the companies propose, create, deliver and capture value within the circular business models, and to answer the second research question, *what are the drivers, enablers and challenges for circular business model implementation*, additional data was needed. This data I chose to collect as primary data by conducting semi-structured interviews. Interviews are extensively used by qualitative researchers to produce empirical data for the studied topic (Eriksson and Kovalainen, 2011). I chose semi-structured interviews as while the interview questions were prepared in advance, the wording and order of them could be altered (Eriksson and Kovalainen, 2011). Further, additional questions could be raised based on the answers. This way, choosing a semi-structured type allowed me to ask company specific secondary questions, which was important as the methods of implementing circularity varied between the companies.

The interviewed companies were chosen from the list through purposeful sampling based on their innovative approaches to implementing circularity. Purposeful sampling refers to identifying "typical, extreme, deviant, or homogeneous cases" (Glesne, 1999, p.2830 cited in Eriksson and Kovalainen, 2011, p.52). I contacted 12 companies via email to propose an interview and out of these, seven companies were willing to and had the resources to participate in the study. Each circular business model type that was identified from the secondary data, the data driven from the company web pages, was applied by one or more of the interviewed companies. From each company, I interviewed the person considered

most suitable to discuss the company's circularity initiatives. The interview guide was sent to the interviewees prior to the interviews to offer the possibility to get familiar with the questions in advance. Due to the COVID-19 pandemic, the interviews were conducted online instead of face-to-face. The interviews took place in September and October 2020, and lasted from 30 to 60 minutes each. The interviews were recorded for the phase of data analysis. My role as a researcher was that of an outsider's, as I have not worked in any of the companies.

3.3. Data analysis

In the data analysis, I used thematic analysis, a common method of organising empirical data (Eriksson and Kovalainen, 2011). Braun and Clarke (2006, p.79) define thematic analysis as a "method for identifying, analysing and reporting patterns (themes) within data". Each theme will capture "something important about the data in relation to the research question" (Braun and Clarke, 2006, p.82). The advantages include flexibility, and being a relatively easy method to learn as a novel researcher (Braun and Clarke, 2006). The flexibility means for example that it is suitable for analysing different types of data, including interviews and textual data (Terry, Hayfield, Clarke and Braun, 2017).

More specifically, I used a more theoretically-oriented and semantic thematic analysis, which often clusters together with realistic positions (Braun and Clarke, 2016). I was familiar with the literature before starting the analysis, and the research questions guided the analysis, representing the theoretical, deductive, way of analysis. In theoretical thematic analysis, more attention is given to some aspects of the data, while the overall description of the data is narrower (Braun and Clarke, 2016). Moreover, I took the semantic approach where the themes are identified based on what can be directly seen from the data, rather than what is beyond the data. The analytic process starts from organizing the data according to patterns and summarizing the data, moving to interpreting the data, usually in relation to previous literature (Braun and Clarke, 2016).

I analysed the two data sets, the secondary data from 65 company web pages and the primary data from interviews with seven company representatives, separately. The data

from the web pages was analysed first. In the data collection phase, I stored the data in an Excel sheet according to the rough circular business model types that I had created based on the criteria in the *#kestävävaate* campaign list and the circular business model types proposed by Bocken et al. (2016). Storing the data this way supported the phase of data analysis as they were already categorised according to the initial themes. After having collected all the data and read through the data set, I started to create codes, coding the information in one column, one method, at a time. According to Eriksson and Kovalainen (2011, p.128), "coding means that the features, instances, issues and themes in empirical data are classified and given a specific label, a code". In the next phase, I refined the initial themes, and finally, drafted the research findings from the first data set. Based on the coding process, I was able to say how each circular business model type is implemented. Having done detailed work in the coding phase, I was also able to say how common each type and method is.

In analysing the second data set, the data from the interviews, I applied more thoroughly the step-by-step guide for thematic analysis presented in Braun and Clarke (2006). Accordingly, the following six steps were taken:

1. In the first phase, I transcribed the recorded interviews into written form, after which, I actively read the entire data through a couple of times. Being familiar with all aspects of the data is important and works as the basis for the rest of the phases (Braun and Clarke, 2006).
2. After reading the data and getting an idea what it includes and what is interesting, I started to create the codes. According to Braun and Clarke (2006, p.88), "codes identify a feature of the data that appears interesting to the analyst". As the themes I created are more theory-driven than data-driven, my research questions guided the coding, while I also paid attention to interesting aspects emerging from the data. I did the coding manually, using highlighters to indicate patterns. The surrounding data was included to ensure that the content of the extract would not be lost. Some extracts of data were coded twice, as they could fit into a couple of themes. The coding was done systematically across all the data. (Braun and Clarke, 2006)
3. In the third phase, I started to form potential themes from the list of codes. I organised the data according to the initial themes into new files. The themes that

present different circular business model types correspond to those created based on the first data set. This data set, however, offers more detailed information on the value proposition, creation, delivery and capture logics. In addition, several initial themes related to circular business model implementation were created.

4. Next, I reworked the initial themes. Many of the additional themes ended up being discarded and the data was included in other themes. In this phase, I re-read the whole data set to ensure everything interesting was included in the themes. As described by Braun and Clarke (2016), thematic analysis involves moving back and forth between the different phases. The final themes include the different circular business model types, and drivers, enablers and challenges for circular business model implementation. The quality criteria proposed by Terry et al. (2017) was followed; each theme should be distinctive and work together with the other themes. Besides, the themes should work in relation to the research questions (Terry et al., 2017).
5. In the fifth phase the themes were refined by organizing the data within each theme. In addition, the themes were given names according to the guidelines by Braun and Clarke (2016); the names should be concise and descriptive.
6. Finally, I wrote the research results in the thesis report, paying attention to trying to make the report consistent and interesting. Data extracts were included to provide illustrative examples from the data, according to Terry et al. (2017).

3.4. Evaluation and ethical considerations

The trustworthiness of qualitative studies can either be assessed with the classic criteria familiar from quantitative studies, validity, reliability and generalizability, or with the criteria proposed by Lincoln and Cuba (1985), credibility, dependability, transferability and confirmability (Eriksson and Kovalainen, 2011). In this study, I chose to apply the former ones as they are considered suitable for studies with realist or critical realist philosophy (Eriksson and Kovalainen, 2011). According to Eriksson and Kovalainen (2011, p.292) validity "refers to the extent to which conclusions drawn in research give an accurate description or explanation of what happened". To establish validity, triangulation of data was used in the study, as discussed previously in the chapter. In triangulation, multiple

perspectives are used to clarify and refine the research findings. One version of reality is considered to exist and approaching it from different directions increases the understanding of that reality. (Eriksson and Kovalainen, 2011). Moreover, the criteria for a good thematic analysis proposed by Braun and Clarke (2006) was followed in the data analysis phase. Also, data extracts are included in the report to increase validity by connecting interpretations to what has been actually said by the interviewees (Guest, MacQueen and Namey, 2014).

Reliability, instead, refers to "the extent to which a measure, procedure or instrument yields the same result on repeated trials" (Eriksson and Kovalainen, 2011, p.292). According to Guest et al. (2014) it is not considered as important as validity in qualitative studies as replication is usually not the goal. However, to increase reliability, I have aimed at describing the research process and steps clearly, as discussed in Yin (2003). Generalizability, finally, "deals with issues of whether the research results can be extended in one way or another into a wider context" (Eriksson and Kovalainen, 2011, p.293). According to Yin (2003, p.32), a method suitable for generalizing the results of a case study is "analytic generalization", in which the research results are compared to previous theory. If the results are supported by existing theory, replication can be claimed. Accordingly, the results of this study are compared to previous theory in chapter 5.

Research ethics concerns the entire research process including research integrity, the acknowledgement of the work of other researchers, and informed consent to participate in the study (Eriksson and Kovalainen, 2011). Throughout the thesis process, I aimed for thoroughness, coherence and accuracy in my work. This included the phases of planning, conducting and reporting the research. I acknowledged, referred and cited the work of other researchers properly. I sent all the interviewees the informed consent form and the General Data Protection Regulation (GDPR) document, including basic information on the research. The participants were offered the opportunity to ask any questions regarding the study. All the data was carefully handled in the phase of analysis and no personal data is presented in the report.

4. Empirical findings

This chapter introduces the empirical findings of the study. First, the studied companies will be shortly presented, second, the different circular business model types will be discussed, and third, the drivers, enablers and challenges for circular business model implementation will be discussed. More details on the order of presentation are provided in the following subchapter.

4.1. Company introduction

As discussed in section 3.2., the studied companies are from FINIX's *#kestävävaate* (sustainable clothing) campaign's list of pioneering Finnish textile companies. These companies have met the circularity criteria set by FINIX researchers, meaning that they all implement circularity in their business models in some way. As a rough yearly revenue limit was drawn to 5 million euros as an additional criteria, all the studied companies are small. The studied companies are manufacturing clothing companies, as all the other companies on the list including second-hand stores, care, repair and maintenance companies, marketplaces, textile recyclers, clothing libraries, household textile companies and accessory companies were excluded for the purposes of this study. All in all, 65 companies were studied, out of which, 7 companies were studied more thoroughly. The 65 companies include companies offering clothes for women, men and children, and the clothes represent a wide variety of styles, functions and materials used.

The interviewed seven companies, as discussed earlier, were selected based on their innovative approaches to implementing circularity. The companies together cover all the CBM types identified from the entire data set and implement circularity in their business models in multiple ways. The companies were decided to be kept anonymous as the interest of the study was in the phenomenon of circular business model implementation and not in the studied companies per se. The companies are referred to as company A, B, C, D, E, F and G. However, something general can be said about the characteristics of these companies. As mentioned, they are all small companies and have been established from 15 to 5 years ago. Sustainability has been a core value for all these companies since

the beginning, and the operations have been built around sustainability, circular economy or both. Similarly, the clothes offered by these companies represent a wide variety of styles and functions, and the most common category is women's wear, followed by men's wear and some examples of children's wear.

The following sections discussing different CBM types each start with an overview based on all the studied 65 companies and are followed by more thorough descriptions from the interview data of the seven companies. The sections discussing the drivers, enablers and challenges, instead, are based on the interview data solely. In chapter 5, the research findings will be summarised in the framework proposed in section 2.5.

4.2. Circular business model types

This subchapter presents the different circular business model types found among the studied companies. The results are organised according to the framework proposed in section 2.5. and the CBM types proposed by Bocken et al. (2016) with some modifications made based on the research data. First, the long life models 'classic long life' and 'encourage sufficiency' are discussed, followed by an additional section for repair service, and the 'extending resource value', 'access and performance', and 'extending product value' models. Rather than separate models, these models should be considered as sub models that can be implemented by manufacturing clothing companies alone or combined, this way, forming unique, innovative circular business models.

4.2.1. Long life models

The long life models, the 'classic long life' and 'encourage sufficiency', are discussed in this section. As presented in Bocken et al. (2016), the characteristics of the 'classic long life' model are also characteristics of the 'encourage sufficiency' model. The latter, however, has additional features that will be discussed under its own title. Importantly, these models also include a high level of services, but only the repair service will be discussed in this section. The rental, take-back and reuse services, in turn, will be discussed in their own sections as they can be seen as their own circular business model types.

Classic long life

The ‘classic long life’ model is clearly the most found circular business model type among the studied companies. In fact, all the studied 65 companies take measures to support the long life of their items, and more than half of the companies specifically state that their items are of high quality and designed for long-term use. Several companies state that by aiming for a long product life, they can best reduce the environmental impacts.

The long life is especially achieved through designing for durability. Here, high-quality materials, material and product tests, material and product development, high-quality manufacturing, and quality control, for example, are discussed. The majority of the companies (54) communicate to be using high-quality and durable materials, some of them even stating to be using only the best and finest of them. Some specify to be using high-quality natural materials only. Fibre length is discussed as an indicator of the quality. Long fibres equal strength, smoothness and less pilling during use. This is also why several companies blend synthetic fibres with natural fibres, to improve the material strength, durability and maintainability. The same goes with the use of elastane, it increases the comfort and durability of the material. However, the companies are aware that it negatively affects the recyclability of the material. This is why other companies prefer using mono materials only. Besides being durable, the materials are selected to be practical and comfortable.

Beyond careful material selection, many companies implement material and product testing to ensure the durability of the items. For example, new designs are being tested by actual users before ending up in production to ensure the practicality, comfort and material durability. Material and product development is likewise named as means to increase product longevity. This means for example that the staple items are kept in the collection season after season and further developed based on customer feedback. Some companies also discuss the durability of seams and prints, and the avoidance of parts and details to ensure long product life. Moreover, around half of the companies highlight the quality of the production, craftsmanship and experienced manufacturing as means to ensure the high quality of the items. For some, this means long and close relationships with producers and

suppliers, for others, producing items in-house or locally in Finland. Several companies monitor the quality through factory visits and by implementing quality checks.

As an indicator of the high quality, a product guarantee can be offered to the items. This is the case with nine of the studied companies. Most often the duration of the guarantee is either undefined or one year. However, one company offers a lifetime warranty for its items, and another company a lifetime warranty for seams and buttons specifically. If needed, the products will be repaired or replaced with a new item. As is noted by some of the companies, the guarantee is only valid for items that have been in normal use and stored and cared for according to the instructions. In some cases, the guarantee is for certain items only.

Other than designing for durability, several companies are engaged in designing for ease of maintenance and repair. These companies state that their items are easy to repair, easy to care for or need to be washed only rarely. In the latter case, the items are mainly made of natural materials such as cashmere, merino and alpaca wool. Reduced need for washing supports a long life while decreasing the environmental impacts. In addition to material selection, this can be achieved through designing loose fits or using prints and colours that hide stains.

Longevity is central to all the interviewed companies' business models as well. For example in the case of company B, quality is seen as the basis for everything, and longevity as the main aim for the items. The company uses high-quality materials, making the items easy to repair, modify and reuse. The materials are tested to ensure the quality. The company stands behind their items by offering a one year guarantee. The interviewee explains that in the case of men's items, the quality and feel of the materials is what matters the most, after which come the certificates and other aspects. Constant balancing with the quality, price and other features is needed, as the price of the items cannot get too high making them unaffordable. Practicality of the materials is also very much considered. For example, elastane is used to support the quality and wearability, and the items need to be easy to wash. Some items are also made easy to modify by having wide seam allowances or not having a separate lining.

Company G designs long-lasting items both by style and functionality and only uses high-quality natural materials that stand wear and wash, and are easy to maintain, repair and recycle. The hiqh quality materials, and sustainable production practices overall, are more expensive and of course affect the pricing of the items. The higher price of the quality materials is also discussed by the interviewee from company A that uses materials that are both ethical, ecological and durable. On the other hand, sustainable and circular practices are seen as beneficial for the business as the amount of conscious consumers is increasing. Similarly company G states that the sustainability aspects have certainly brought new customers to them. This can be seen from the webstore analytics as well; customers often end up in their site with search terms related to sustainability. Finally, the interviewee from company F explains that they have found a customer base that values their high-quality materials and items and is ready to invest in them.

> *"And for sure we have gotten and are all the time getting new customers thanks to the sustainability actions. I analyse our online store to see how people end up there and yes, one of the most used search terms is sustainability and sustainable design and Finnish sustainable fashion and so on. So yes, the topics are very much of interest and direct [the people] then straight to us."* (Company G)

Encourage sufficiency

The 'encourage sufficiency' business model was presented in the literature as similar to the 'classic long life' model but with an additional focus on a non-consumerist approach to sales, promotion and marketing, and no built-in obsolescence. The model focuses on influencing and mitigating consumption, and minimizing impacts during use, for example by providing environmentally-friendly care instructions. These features are given a separate thought in this section.

As many as 47 companies out of the studied 65 companies state that they implement long-lasting, timeless designs in their items. This is achieved for example through simplicity, minimalism, classic designs, and timeless and plain colours. Some companies discuss meaningful design as a means to promote sufficiency. Several companies mention

that they design items for long-term use, favourite items to be loved for years. This requires the items to both look and feel good, fit well and to be practical and easy to care for. The items are designed to be versatile, for example suitable for both everyday and festive use, in order to reduce the total amount of items needed. In addition, 17 companies state that their items are seasonless. An item can be kept in the collection for years with only minor adjustments and changes to colour. The clothes are designed to be easy to combine with different items and with items from the past collections as well.

What is more, several companies have a policy to not do seasonal sales. This goes hand in hand with offering timeless styles and producing items only according to the need. One company states that constant sales encourage purchasing items that are not really needed. On the contrary, these companies encourage their customers to make well-thought purchases. One company aims to create attitudinal change; while the price of a quality item can be higher, in the long run, quality over quantity becomes also financially beneficial. Fast fashion, throw-away mentality and quickly changing trends are raised as the opposites to how these companies operate. Other means to promote longevity and reduce consumption by the companies include designing adjustable sizes or transformable items. The former especially in the context of children's clothing, and the latter, in the context of festive and avant-garde items.

To further support the long life of the items, more than half of the studied companies have a separate section for care instructions on their webpage. Many of them highlight environmentally-friendly clothing care practices. What is more, several companies state to encourage their customers to care and repair the items, for example by offering a maintenance booklet. Few companies also have care products for sale. A couple examples of collaboration with a local company specialised in clothing care were also found in the form of workshops for customers and the sales staff.

Encouraging sufficiency, especially in terms of long-lasting design, is present in the business models of all the interviewed companies as well. The interviewee from company A discusses their seasonless items; the same basic items stay in the collection and only the materials and prints vary. And of course the items are further developed when needed. This

provides additional value for the customers as they know that the styles and models are going to stay the same. The items are also designed to be suitable for many occasions, both for everyday and festive use, this way reducing the need to own so many different items. In addition, many of their items are one size items, designed to fit for many different body types. This is also beneficial considering the reuse of the items as they are suitable for many second users. Company G's items are designed to fit for many body sizes and to be timeless and gender neutral. In addition, the interviewee explains that their customers are active in providing feedback and development ideas, and for example, the sizing of their items has been affected by the wishes of their customers. The feedback is considered extremely valuable. They also encourage their customers to take care of the items and provide instructions. This is done in a way that emphasises the good feeling associated with clothing care. Finally, company D discusses sufficiency in the form of reversible and multifunctional items, designed to be suitable for different kinds of uses.

> *"We design products so that they work in as many situations as possible. The aim is to produce items that are suitable for both everyday and festive use so that people do not have to buy so many garments that end up staying in the wardrobe, but the same product can be used for as long as possible and on different occasions."* (Company A)

Innovatively, company F offers the option to return or change an item within three months from the purchase against a small additional fee at the time of purchase. During the three months, the item can be worn, and in case of having second thoughts, the customer can return the item and receive a refund worth 80 percent of the original price of the item. The returned items are maintained and sold as second-hand items to new customers. The service was set up especially to respond to the demand from customers who were worried that the woollen items would itch. The possibility to test the item properly supports making purchases that end up in use.

Repair service

In the ‘classic long life’ model, long-lasting design is combined with a high level of services such as maintenance and repair. Repair service is offered by 17 of the studied 65 companies. These companies discuss the importance of repairing items to extend the product life. Some companies have a standard pricing for certain care and repair services while others state that the price is case-specific, and others do not mention the price of the service at all. In some cases, the service is offered only for the price of the shipping fee or for a small compensation. One company offers repair service for free for regular customers. Some companies sell the repair service in their online store making it easy for the customer to buy the service and then bring or ship the item to the store. To carry out the repairs, few companies communicate to partially or fully cooperate with sewing shops as an alternative to carrying them out in-house. Other than repairs, some companies offer alteration service according to the customer’s measurements, and one example of a redesign service was also found. These services are offered to extend the product life. When the clothing fits well, it will more likely be used for long.

Examples of maintenance and repair services can be found from the interviewed companies as well, with four or them offering a repair service to further support the long product life. For example company G’s repair and maintenance service, established ten years ago, supports their aim of lengthening the lifetime of their items. The interviewee refers to the fact that a long-lasting item is the most ecological one. Besides, the company uses natural materials that are easy to maintain and also very expensive. In addition, the service was set up to respond to the needs of the customers. The interviewee explains that they are here to support them. The customer can decide whether to take a full service, or to do some of the maintenance at home themselves. The feedback they receive when they meet the customers is of high value in terms of developing the items and their life cycle further. The company does not have a partner for the service, but does everything in-house. As they know the materials, they feel like they have the best capabilities for conducting the maintenance. Initially, the service was free of charge for the customers, but later became chargeable and a more established part of the business. The interviewee explains, however, that it is more important for them to extend the life of their customers’ items than for the

service to be profitable. By far, over one thousand items have been maintained by the company. The interviewee believes that many of the customers are their customers due to their actions to promote longevity.

Company F similarly uses 100 percent natural materials only. The interviewee explains that while synthetic materials would provide strength, the use of material blends would contradict with the idea of circularity and recyclability. Hence, they offer a repair and maintenance service. Similar to company G, the service is seen as a natural continuum for offering long-lasting, high-quality items. The service is operated either by a local partner or by the employees themselves. They likewise highlight that the employees are skilled to do the maintenance. Typically, the smaller tasks such as pill removal and repairing small holes are done in-house, and the bigger tasks such as making elbow patches by the partner. Currently, they are considering whether to start operating the service fully in-house or to acquire new partners from different parts of Finland instead. In the latter case, the idea is that it would be more convenient for the customer to be able to get the service locally. The price of their service is competitive and items are being maintained weekly. While the service might not be very profitable, again, supporting the long product life is highly important for the company. Besides, by offering the customers a high level of services, the company believes to attract loyal customers, who can trust the company no matter what. The service has been warmly welcomed and the customers are grateful for having found a company that offers a repair service.

> *"We offer our customers almost the whole package when they buy a product from us. They can repair the product through us and they can send it back to us when it is no longer used, so it certainly brings us more loyal customers as they trust us and know that if anything comes, they can ask us … We have a lot of customers who buy their [product type] only from us so it has of course been a good thing and had a positive impact saleswise."* (Company F)

Company B offers both repair and alteration services. The alteration service has been operated since the very beginning, and the repair service a couple of years, since the opening of the physical store. These services are supported by design for repairability and

adjustability. The services are conducted in-house, but if the demand grows, they have a local tailor in mind to become a future partner. The reception from customers has been warm and surprised of having an alteration service available for everyday wear as well. The interviewee explains that the customers have come to realise that a well-fitting garment both looks and feels good. They want to ensure that the items fit well and that customers can rely on them. Similarly company E offers repair and alteration services, both of them since the very beginning. As in the previous case, the services are conducted by the company itself. If the demand for the service would increase, they would consider taking a local partner. Currently the service volumes are not big, but there is constantly something on their table. The alteration service is in a bigger role.

4.2.2. Extending resource value

Out of the studied 65 companies, 31 companies in total use recycled, repurposed or leftover materials in their items, representing the 'extending resource value' business model. This way they reduce the need for virgin materials and natural resource extraction. While some companies use only one type, some use a wide selection of different recycled, repurposed and leftover materials. The share of use varies from less than 5 percent to full 100 percent of the total material use. Many of the companies are planning to increase the amount in the future. Importantly, several companies make the note that the recycled materials must meet the quality criteria set by the company to end up in the material portfolio.

The selection of recycled materials used by the companies (22) is wide. Here, it is important to note that not all the recycled materials used are from the textile industry, but from other industries as well. This is the case with recycled polyester and recycled nylon. The recycled materials from the same industry include recycled cotton, recycled wool, recycled cashmere, recycled elastane, and an innovative material made of cotton scraps and wood pulp. Recycled cotton is always mixed with either organic cotton or recycled polyester to increase the material quality. One of the studied companies produces its own recycled material, and the material, made of cotton cutting waste and recycled polyester, is used by several other of the studied companies as well. The company states that the quality

and comfort of their items is the same as those made out of virgin materials, however, the material development is ongoing. They have also launched a collection with material partly made from post consumer textile waste. Overall, the recycled materials are still more expensive compared to their virgin alternatives as they are yet to become widespread.

The repurposed materials used by the companies (7) include post consumer textiles such as hotel and restaurant textiles, old curtain fabrics, jeans and reused leather from old jackets and sofas. While hotel and restaurant textiles are collected from local partners specialised in industrial textiles, smaller amounts of materials are collected from recycling centers and flea markets. As stated by the companies, the high-quality industrial materials, for example, are most often still in great condition at the time of discarding. Finally, the leftover materials used by the companies (7) include Finnish and European surplus textiles, fabrics from old factories and makers, and leftover leather from fashion and furniture industries.

Different types of recycled, repurposed and leftover materials are also used by the interviewed companies. Company D, since the establishment, has used recycled materials in their items solely. The materials are made from waste material from other industries, such as plastic waste collected from the oceans. By using recycled materials instead of virgin ones, they can prevent waste and save carbon emissions. The used material does not differ from its virgin alternative, not in the phase of manufacturing nor in the phase of use. The company with its circular offerings has received a warm reception since the very beginning, both from the customers and the media, and continues to do so.

> *"It still feels like it [the circularity of the product] definitely is our driving force, although there are many other design related things, such as how the items look and feel like. But yes, the circular economy principle itself has certainly been the driving force for the customers also, and it has been received very well."* (Company D)

The prices of the items were questioned in the beginning, but as the awareness on sustainability challenges has increased, so has the understanding. Both the manufacturers

and material producers are key partners for the company. The current material was initially found via the manufacturer who also imports the material. With one of the material producers, the company stays in touch regularly to develop the material properties such as colours further, material development being one of their key activities. With the properties of the other material, the company has been satisfied since the very beginning. This material, according to the provider, can also be regenerated again in an endless loop. The interviewee makes an important point regarding the value capture; while the prices of recycled materials are still higher than those of virgin alternatives, it is possible to do profitable business.

Company E's value proposition, in turn, is centered around offering clothes and accessories made of repurposed textiles from textile rental companies, previously used by health care, hotel or restaurant industries. Reusing materials consumes less energy and other resources as compared to material recycling. Initially, the company started its operations by reusing textiles found from flea markets, for example. The current material type was found via a former intern. The main idea is to maintain the value of the materials by providing them a new life. The textiles are no longer used in their original purpose due minor flaws, for example. The main material the company uses are sheets that are usually equal in quality regardless of the material provider. These polyester-cotton fabrics are strong, durable and easy to maintain. The material providers have been found both from Finland and abroad, and all of them have been responsive and willing to cooperate.

> *"Well basically everyone we have approached has been extremely responsive. In principle, they want to cooperate. In the best case they are quite proud of their own products that they offer their customers and then they feel the pain of them being incinerated, which is basically the option if we do not take them ... Somehow it feels like it supports both."* (Company E)

Working with the material is more demanding for the manufacturer, as it is not of uniform quality. The material needs to be checked for flaws by hand, and the flaws affect the handling and cutting of the fabric. The company, however, has already some years of experience and has been cooperating with the same manufacturer for long. By trial and

error, they have found common, functioning working methods. This kind of operation mode is also financially more flexible as no big stocks are needed that would tie up resources. The company's policy is to stay open to innovations and their material selection includes some innovative recycled materials, and leftover materials from the Finnish textile industry as well, bringing diversity to the collections.

Also companies B, A and C use recycled or leftover materials in their items on a smaller scale. Company B has begun to introduce some recycled materials in its collections, and company A, when possible, uses leftover materials found from Finnish textile wholesalers. Giving a new life to these high-quality leftover materials in the form of clothing is considered important. The leftover materials used by company C, in their most recent collection, are mainly leftover materials from their own production. Additional leftover materials are sourced from their long-term material suppliers. This is to demonstrate the long-term value of these materials.

> *"This [the use of leftover materials] is to point out that especially since our products are not committed to trends, the materials are beautiful and relevant, even if they are not from the newest season. And that is something we want to increase in the future so that it becomes a permanent part of our operations."* (Company C)

4.2.3. Access and performance

'Access and performance' is the least common circular business model type found in the studied 65 companies, with only three of them operating their own rental service. In addition, few companies communicate that their items can be rented from Finnish clothing libraries. Some common elements can be found in all the three rental services; they are either recently launched or to be further expanded, and the selection includes unique items. One company offers the service currently for its evening wear and unique pieces, as these items are typically needed only a couple of times a year. The pieces are available for rent at the company's studio. The company communicates to be working on a rental service for its ready to wear products as well. Another company has recently launched its rental service in one of its stores and communicates to expand it to online and other stores in the near

future. The product selection includes older treasures from the brand, according to the wishes of customers. The unique items are only to be shared and cannot be purchased after the rental period as is the case with the items from the newest collection. The user of the service does not need to worry about the clothing care as the items are professionally maintained by partnering companies.

The same goes with the third company, one of the interviewed companies. The service has been rather recently launched, and the selection includes items from both existing, upcoming and previous collections. The items are sample items that are now brought to use for a wide audience. This way also the environmental impacts of the samples can be mitigated. Being able to offer the quality items for a wider audience due to the smaller cost, the rental fee, is considered highly valuable by the company. The items are available for short-term rental at the company's store, and the maintenance is taken care of by the company. The service was set up to communicate the long-term value of the items and to answer the demand from customers who had made inquiries on items from past collections. According to the interviewee the service has received a warm welcome, yet, renting clothes is still a rather new concept to many. This is supported by the fact that it is the least found CBM type among the studied companies. The service as it is today is the company's way to explore circular services on a small scale. Financially it represents a small percentage of the company's yearly revenue.

> *"When it was launched it aroused a lot of interest and people were really excited that hey this is a really great thing and wonderful that a brand itself is doing this. But it is clearly still a new thing in practice for people to rent clothes, so it requires a little bit of encouragement maybe, but it has taken off quite nicely."* (Company C)

One interviewed company not operating a rental service brings valuable viewpoints to the discussion. They offer menswear and note that men and women consume clothing differently, and rental service might not be of interest to men. Typically, men prefer convenience, and are more need-oriented than interested in variation. Rental service is considered suitable primarily for evening wear occasions. This is supported by the results

of their recent customer survey as well. Hence, the company has decided to focus on the services that are more of interest to their customers.

4.2.4. Extending product value

The last circular business model type, the 'extending product value' business model can be found in 17 of the studied 65 companies. These companies have a take-back system set up for their items. While some take back items no matter the condition, some only the ones suitable for reuse, and some only the ones at the end of their life. The used items can be sent or brought back to the stores, and a compensation is typically offered, either as a voucher or a discount coupon for the next purchase. The amount of compensation is either a fixed percentage or depends on the condition of the item. Also alternative modes of organising take-back and reuse services are found. A couple of the companies organise take-back for reusable items in cooperation with online second-hand stores. Moreover, few companies themselves maintain a Facebook group for selling and buying the brand's used items.

Some companies care and repair the items suitable for reuse and resell them in their own channels including physical, online and outlet stores. Other than reselling, some companies donate the used item to second-hand stores. The ones towards the end of their life as clothes are either upcycled to smaller items, downcycled to other purposes, or forwarded to textile recycling companies. A company offering items made from its own recycled material, uses the returned items in its research and development projects on post-consumer textile recycling. The goal is to be able to use them as raw material for new textiles in the future. Not all companies, however, specify the method of recycling.

All of the interviewed companies have a take-back system set up and three of them sell second-hand items in their own channels. The ways of implementing the services vary. Company F tries to prevent their items ending up unused in the closets by offering the opportunity to send them back in exchange for a voucher. The amount of the voucher depends on the condition of the item. The interviewee explains that it is natural that at some point, the items do not fit or please the customer anymore. With the voucher, the

customer can buy a more pleasant item. The returned items are taken to the laundry, maintained, and repaired when needed, after which they are resold in online and physical stores. The maintenance is done either in-house or by a local seamstress partner. The service was set up as the company noticed the high resale value of their items and wanted to offer their customers an easy way to sell them further. While selling an item in a Facebook group can be more profitable to the customer, it might come with additional effort and risk. However, according to the wishes of the customers, the company has also set up a Facebook group where customers can exchange, sell and buy used items, if preferred. The second-hand items have been popular and generated additional profits for the company. The lower price of the items has most likely attracted new customers. This way, the take-back and reuse services create value for both the first and the second user. As the company is approaching the age of 10, it is planning to start taking back items at the end of their lifetime as well. The idea is to use them as raw material for new items in the future. For this, a partner would be needed.

> *"And of course it has been nice additional business for us. We have probably gotten new customers as the price is cheaper for the used product than for the normal product. This way it becomes accessible for new customers that may not have the 200 euros to pay for a [product type] so then they can buy it at a more affordable price."* (Company F)

A similar story is told by company C as well. Their take-back and reuse service, set up a few years ago, was established to communicate the long-term value of the items. They also had noticed the high resale value of the items, for example through a second-hand Facebook group set up by their customers, and wanted to offer their own service as an alternative. In addition, the service was their way to explore new opportunities. The service has been received very well and faced a high demand. Only recently, they have had the second-hand items available full-time as the amount of items received was previously not that high. As opposed to company F, they do not maintain the items, but expect them to be clean and in a good condition when brought back.

Company G similarly takes back items offering a discount coupon in return. However, they take back items both suitable for reuse and at the end of use phase. The items in good condition are maintained and resold, and the rest is used as material for creating new, small items or elbow patches, for example. All the maintenance and repairing is done by the company employees themselves. Setting up the service felt natural to the company aiming for longevity and a closed loop. They want to take responsibility for the items throughout their lifecycle, as opposed to the industry standard where the responsibility ends at the cashier. Besides, being able to resell the used items as treasures for new customers is considered amazing. While the second-hand service has been operating for long, the COVID-19 pandemic created an opportunity to develop the service further. To get through the challenging time of having to keep the store closed, the company decided to relaunch the service on a bigger scale. The sales staff had now time to maintain the second-hand items. Previously, the items were only sold at the physical store, and not in high numbers, as they were moving so fast. Now, the company was able to expand the service online as well. This was considered as a saviour in the hard times and the reactions were very supportive. The company believes that the circular services are part of the reason for attracting their current and new customers.

> *"We want to take responsibility for the product until the end. It feels like there are a lot of clothing stores or companies selling something so that their responsibility ends when the product is sold and we want to do just the opposite. We create such a good product that we can really stand behind it even after the product is with the customer."* (Company G)

In addition to these more established services, company E that has previously organised occasional clothing swap events for customers to swap used pieces from the brand, is currently launching a new service. Used items will be collected from customers and repaired or redesigned into a collection of their own. The idea behind the service is to maintain or even increase the value of these items. The interviewee notes that as the service is only to be launched, it remains to be seen how much and what kind of used items they will receive. In the near future, the company is also interested in developing use-based services that would disrupt the traditional ways of consumption.

Similarly company A has organised events where customers and brand representatives alike can sell and buy used items from the brand. In addition, they partner with an online second-hand store. Customers can send their used items to the partner and receive a voucher in return that can be used to purchase a new item from the company. Customers are encouraged to recycle the items no longer in use as the items made in limited quantities maintain their value well and it might even increase.

4.3. Circular business model implementation

In this subchapter, the drivers, enablers and challenges related to circular business model implementation are discussed. The topics are examined by using the second data set, the data from the interviews with seven company representatives. Sustainability is a core value for all the interviewed companies and has been since the very beginning. The operations of these companies have been built around sustainability, circular economy or both right from the start. In addition, the items of the companies are characterised by high quality and longevity. These and other drivers and enablers for implementing circular business models are discussed next.

Drivers and enablers

Drivers and enablers for circular business model implementation were found under categories ‘social’, ‘supply chain’ and ‘organisational’, whereas under categories ‘economic’, ‘institutional’ and ‘technological and informational’, nothing was found. These categories were presented in the literature review in section 2.3.3. On the contrary, regarding the economic drivers, the interviewee from company D stated that at the time of establishing their business, no financial support was known to exist for sustainable or circular businesses specifically. One additional category, ‘product’, was created based on the interview data. The drivers and enablers, together with the challenges, are summarised in table 3 in the end of the subchapter.

The driver that was most discussed is sustainability as a core value, falling under the category 'organisational'. In the case of company D, the awareness of the industry's challenges and the feeling of guilt for being a clothing designer by profession, were the driving forces to establish a sustainable business specifically. According to the interviewee, there would have been no other way to establish a business for them. The same goes with company G, for whom sustainability has been the starting point for establishing the business. Otherwise, they could not justify their business for themselves. The interest towards sustainability and circular economy works as their internal driver. The representative of company B, in turn, underlines that since the very beginning, sustainability and transparency have been integrated in their operating principles, thus acting as an enabling force. Sustainability has been the reason for establishing the company in the first place. Also for company A, sustainability has always been an important value and is integrated in the company DNA. For company F, the awareness of the employees has been the driving force, possibly explained by their rather low average age. Sustainability is highly important for both the CEO and the employees. Moreover, as a young company, they are flexible and not stuck in any old modes of operation. Another organisational driver, raised by one of the interviewees, is related to skills and knowledge. The interviewee from company B discusses the long industry experience of the company founders, and the skills and knowledge gained from that. In addition, the culture of constant development and search for new information works as an enabler for further implementing circularity.

> *"When we founded [the company name] we created a concept that if we start to do this then this is the way we do it, and sustainability and transparency and all that was included there in our operating principles, and then choices have been made accordingly along the way."* (Company B)

The second major driver found is the increasing awareness on sustainability, falling under the category 'social'. The interviewee from company G explains that people are increasingly becoming aware of sustainability issues and as a result, have started to invest in sustainable items. They consider that the COVID-19 situation has further accelerated the interest towards sustainability topics. Company C, likewise, discusses the increasing

awareness on environmental and ethical issues to speed up the demand for new, circular services. Also the representative of company B mentions the topicality of sustainability and circular economy, and the increasing awareness, especially among younger consumers. They hope that it will be reflected in the behaviour of the consumers as well. The increasing awareness is recognised by company A as well.

Beyond the increasing awareness, direct customer demand has worked as an important driver for establishing circular services. The interviewee from company G explains that for example the maintenance service has been set up to meet the customer needs. The same goes with company C that launched the rental service to respond to the wishes of the customers. In addition, supportive customers are important enablers for the companies. Company F, for example, has found a customer base that values high-quality items and is ready to invest in them. For company D, the respect from customers has been an important enabler since the very beginning. Also for company E, a major enabler has been the warm reception of their circular concept and the surrounding positive atmosphere.

Four of the company representatives raised the high quality of the items as an important enabler for further implementing circularity. The interviewee from company C explains that designing items for long-term use with long-term value has been their operating principle since the very beginning. Both the physical and emotional durability of their items supports the implementation of circular services as the items are attractive for the next user as well.

> *"We have noticed, also through our customers, that there is demand for our products so that there is the first user and then the second and then the third. At best they last for a really long time physically, and also the aesthetic and emotional value is long-lasting. This has created great opportunities to develop those [circular] services."* (Company C)

Similarly for company F, the high quality and resale value of the items has been the driver for establishing circular services. The quality enables the items to be kept long in use and to be maintained and repaired when needed. Thus, the services have felt a natural

continuum for the quality items and have not been established with the initial idea of promoting a circular economy. Only recently has the company started to consider circularity itself. Also the interviewee from company G discusses the services as a natural continuum for using high-quality materials. The interviewee from company B summarises that it all starts from high-quality materials and items designed for long-term use.

> *"We believe that our product really is durable and can be repaired and used for many years as long as it is taken care of ... so it has come to us quite naturally, we all have been of the opinion that it is quite smart to offer a repair service, it is smart to resell products, both financially and considering our values."* (Company F)

Finally, under the category 'supply chain', an enabler for company F has been choosing suppliers that share the same values and produce high quality. This enables keeping the items in the loop for long. Company A, in turn, has a short supply chain, which enables them to easily make decisions, and to closely collaborate with the suppliers and monitor the operations. An enabler for company B is the increased availability of, for example, recycled materials at high-quality suppliers. Regular visits to fashion trade shows support finding these new materials.

Challenges

The final section of the empirical findings takes a look at the challenges the interviewed companies have faced in implementing circular business models. Also, a couple of examples are given on how to overcome some of these challenges. The challenges found fall under categories 'organisational', 'technological and informational', 'social', 'supply chain', 'product' and 'economic', whereas nothing was found under category 'institutional'.

A much discussed topic among the interviewed companies, and the most common challenge faced, is related to sustainability communication, falling under the category 'organisational'. For example for company B, finding the best way to communicate their

circularity and sustainability approaches to customers has been challenging. They are pondering how to do it in an inspiring and concrete way. Support from external parties, such as NGOs, has been helpful in bringing concreteness and facts to the communication. Also, external recognition as a pioneer in sustainability has provided the company with courage to communicate more boldly. Similarly, the interviewee from company D states that room for improvement in communicating their circularity and sustainability related issues exists. As many things feel so obvious for the company, they might go unmentioned. However, this is something they want to develop. For example, the versatility of the items, the care instructions and the new take-back concept could be better communicated. They feel that legislation or clear guidelines on sustainability communication could be of help and ensure that everything necessary is communicated to consumers.

> *"I also call for legislation in that if it was clear what should be... and the guidelines and recommendations would be very clear and of course the same for everyone, then it would not happen that well we just do not mention it even if it is something that we do. So if we could get clearer guidelines to it, then they would be told to the consumer for sure."* (Company D)

Company A, in a similar manner, did not previously communicate the sustainability topics extensively on the website as they were considered so obvious, and has only recently started to add more information. Communicating more extensively is considered to attract new, conscious customers. The situation is the same for company E as well. While they have always had a repair service, they did not realise the need to communicate it specifically until recently.

> *"Our repair and modification services have always been there but we have been communicating about them very poorly. It has been more like we have not somehow realised that it is not obvious. Only when it became a much more discussed topic did we realise to start talking about it."* (Company E)

A major challenge for the same company has been finding a way to communicate their unique, circular economy based concept to international buyers especially. This is as the

concept of reusing industrial polyester-cotton textiles differs from the previously more common sustainability approaches such as the use of organic materials. Communicating the concept remains somewhat challenging also to the customers in Finland. They have also been changing their main message from sometimes more sustainability and production focused to other times more design focused in order to see what the customer is interested in. Recently, they have opted for the sustainability focus as the topic has become more accurate. The interviewee from company C, in turn, discusses the challenge that greenwashing and the lack of 'rules' in sustainability communication poses; the word 'sustainable' has become overused and lost its meaning. As a result, the company has become very careful in its own sustainability communication. A similar observation has been made by company B as well.

> *"... there is no control in that and everybody can say anything. That is of course a big challenge ... that is also why we have for a long time not wanted to talk about those things [sustainability and circularity] with big words because we want to be sure that we do not talk about things that are not really true ... I think it is a big challenge in the industry as a whole."* (Company C)

The second most common challenge is related to CE knowledge and information finding, falling under the category 'technological and informational'. The interviewee from company F explains that information on circular economy and the best practices remains unclear and scattered. Thus, searching for information requires a lot of resources. The interviewee is delighted with the increasing amount of research projects on circular textiles taking place in Finland, hoping that they will result in common sources for information. The same challenge is identified by company E as well, for whom finding information on the use of repurposed materials especially has been a challenge as example cases barely exist. This again has meant more work for the company.

The rest of the challenges were reported each by one company only. Falling under the category 'social', the interviewee from company B raises the negative communication around the fashion industry as a challenge for the small, sustainably operating brands. If the communication around fashion is constantly negative in the media, and fast fashion and

fashion overall are considered as one, the conscious consumers, the customers of these small companies, retain buying items even from them. Hence, the negative communication might end up hurting these companies the most. The *#kestävävaate* campaign bringing up industry pioneers was considered great and something that was needed alongside the negative communication. Company A, in turn, discusses the challenge of predicting the constantly changing demand to avoid excess production. For them, the solution has been seasonless items, small quantities and a short supply chain that allows quick moves based on the customer data. Also, price sensitivity of customers is mentioned by the interviewee from company E. Understanding the price structure might be difficult for some, especially as the items are made from repurposed materials.

'Supply chain' related challenges are discussed by three of the company representatives. The minimum order quantities of fabrics pose a challenge for small companies, as experienced by company B. According to the interviewee, the situation has become even more challenging as the amount of stock fabrics available at suppliers has significantly decreased over the years. The availability of organic materials has not been great during the past years either. For company F, the supply chain challenges have been related to differences in sustainability-thinking in different countries. For example, the amount of cutting waste from production was a surprise for the company that had thought it to be almost non-existent. For company G, shortening the supply chain remains a challenge with certain materials, while for company D, the challenge is to move the production closer to Europe.

Similarly the 'product' related challenges experienced vary between the companies. A major challenge for company B has been balancing between different properties of fabrics: quality, sustainability and price. As the final product must be accessible for the customers, the price cannot get too high. The challenge of company D concerns the material durability as their items are typically under high strain. Developing the fabric to be as durable as possible to ensure a long product life, while maintaining the softness, is the company's biggest challenge. Company G raises a challenge concerning its future plans; the recycled material alternative might not allow the use of colours in a similar manner to its virgin counterpart.

Finally, under category ‘economic’, the lack of resources is directly discussed by only one of the interviewees. In the case of company C, being a small company with limited resources has hindered developing the operations further. However, the company has been able to implement circular services on a small scale. This is exactly their way of overcoming the challenge of limited resources; to go forward step by step. In addition, company B names scaling up the business as their biggest challenge. New customers are needed to grow the business and to be able to continue the operations. This is why they need to ensure that the products are affordable for many. The interviewee underlines that economic sustainability needs to be considered in addition to the environmental and social sustainability aspects. The following table 3 summarises the drivers, enablers and challenges discussed by the companies.

Table 3. Drivers, enablers and challenges found.

Category	**Adoption factors: drivers and enablers**	**Adoption factors: challenges**
Economic	-	Lack of resources, Scaling up the business
Social	Increasing awareness on sustainability issues, Supportive customers, Customer demand	Negative communication around fashion industry, Constantly changing demand, Price sensitivity of customers
Institutional	-	-
Technological and informational	-	Finding information on circular practices
Supply chain	Suppliers with same values and quality production, Short supply chain, Increased availability of recycled materials	Availability of materials, Cultural differences in sustainability-thinking, Shortening the supply chain
Organisational	Sustainability as a core value, Young company culture, Skills and knowledge from long industry experience, Culture of constant development	Communicating circularity and sustainability
Product	Suitability of high-quality items for circular services	Balancing between the quality and price of materials, Durability of materials under

		high strain, Ability of recycled material to present colours

5. Discussion and analysis

In this chapter, the theoretical framework proposed in section 2.5. is applied and adjusted according to the empirical findings, this way also summarizing the previous chapter. In addition, the main empirical findings will be discussed and analysed in the light of the reviewed literature. The circular business model types will be discussed first, followed by a discussion on the drivers, enablers and challenges.

In the thesis, the circular business model types developed by Bocken et al. (2016) were used as a basis for the proposed framework and for organising the empirical results. The authors suggested creating new forms, combinations or sub models of the proposed CBM types in future research. Accordingly, the CBM types were adjusted to better correspond to the possible CBM types for manufacturing clothing companies. In the proposed framework, design for durability is considered enough to be engaged in the 'classic long life' model and the services are considered separately as opposed to the original type combining durable items with high level of services. Repair service is added as a separate CBM type, or sub model, and reuse service is considered under 'extending product value'. The 'encourage sufficiency' model considers only the actions taken to mitigate consumption and avoid obsolescence. Truly, these models can be seen as sub models that can be implemented by manufacturing clothing companies alone or combined to form innovative circular business models, as is the case with many of the studied companies. This way the framework presented in figure 4 below summarises the answer to the research question 1, *how do Finnish manufacturing clothing companies implement circularity in their business models?*

As discussed in section 2.5., the framework also includes an additional dimension for adoption factors, the drivers, enablers and challenges for CBM implementation, according to the proposals by Lewandowski (2016) and Antikainen and Valkokari (2016). This way it

also summarises the answer to the second research question, *what are the drivers, enablers and challenges for circular business model implementation?* The adoption factors reported by multiple companies are written in regular text, while the ones experienced by one company only are written in *italics*.

Circular business model	**Value proposition**	**Value creation and delivery**	**Value capture**
Classic long life	High-quality and durable items made of high-quality materials	Durable product design, Careful material selection, Product development, High-quality production	Higher pricing justifies fewer sales, Quality materials more expensive, New customers due to sustainable operations
Encourage sufficiency	Timeless design, Versatile, seasonless items, Care instructions	Timeless design, Gradual product development, Providing care instructions	Higher pricing justifies fewer sales, No seasonal sales
Repair service	Maintenance and repair service to extend the life of the items	Maintenance conducted in-house or with a local partner	New loyal customers due to high level of services
Extending resource value	Items made of recycled, repurposed and leftover materials with a lower environmental impact	Material sourcing, Material development, Close partnerships with producers and material providers	Higher material costs in the case of recycled materials, Can be profitable
Access and performance	Short term rental for clothes and accessories, Unique pieces available for many users	Maintenance taken over by the company	Some additional revenue for the company
Extending product value	Second-hand items in good condition with a lower price, Easy way of getting rid of unused items	Product take-back in exchange for a voucher, Maintenance and repair of the returned items without or with a partner, Recycling	Additional revenue from the sale of second-hand items, New customers
Adoption factors: drivers and enablers Sustainability as a core value Increasing awareness on sustainability issues Supportive customers Customer demand		**Adoption factors: challenges** Communicating circularity and sustainability Finding information on circular practices *Negative communication around fashion industry*	

Suitability of high-quality items for circular services *Young company culture* *Skills and knowledge from long industry experience* *Culture of constant development* *Suppliers with same values and quality production* *Short supply chain* *Increased availability of recycled materials*	*Constantly changing demand* *Price sensitivity of customers* *Availability of materials* *Cultural differences in sustainability-thinking* *Shortening the supply chain* *Balancing between the quality and price of materials* *Durability of materials under high strain* *Ability of recycled material to present colours* *Lack of resources* *Scaling up the business*

Figure 4. Revised theoretical framework and summary of findings.

According to the reviewed literature, the implementation of CBMs has been slow (Guldmann and Huulgaard, 2020; Vermunt et al., 2019). The results of this study provide a different picture. However, it is important to note that the studied 65 companies are companies that had been listed according to circularity criteria, meaning that they all implement circularity in their business models at least to some extent and represent the Finnish industry pioneers of their size. What is more, the interviewed companies were selected based on their innovative circular business models, meaning that they implement circularity in their business models in multiple ways each. Besides, sustainability has been an important value for these companies since their establishment. In the reviewed literature, Todeschini et al. (2017), for example, stated that born-sustainable companies often create unique value propositions by combining different circular methods in their business models. The studied companies should be considered as pioneers in circular business model implementation.

All the studied 65 companies were engaged in the ‘classic long life’ model in some ways. As specifically mentioned by several companies, by producing long-life items, they can best reduce the environmental impacts. Indeed, the most effective way to design out waste and pollution is to increase the number of times garments are worn (EMF, 2017). The means to create long-life items are mainly related to designing for durability and the use of high-quality materials with long fibre length. Some aspects are contradictory, and for example the discussion around material blends and the use of elastane has two sides to it, also noted by EMF (2017), Franco (2017) and Pal and Gander (2018). On one hand, the use of material blends makes the material recycling more challenging, this way

contradicting the idea of CE, and on the other hand, it provides strength and comfort, this way supporting the long product life, also very inherent to circular economy. For example Stahel (1994) stated that reuse (long product life) should be preferred over recycling both in terms of environmental and economic benefits. Similarly, the findings of a recent study by Levänen et al. (2021) demonstrate that in the context of textiles, extended use has the lowest global warming impact, whereas recycling does not create as significant benefits.

In addition to high-quality materials, the studied companies discuss material and product tests, material and product development, high-quality manufacturing, and quality control as means to support longevity as well as designing for easy maintenance and repair. Even though the high-quality and more sustainable materials are more expensive, the interviewed companies consider them to create additional value by attracting new and existing customers valuing sustainability in their purchasing decisions. While almost all the types, the sub models, proposed in the framework can be implemented separately, or even all of them combined, what became evident from the findings, and the literature as well (Armstrong, 2015; EMF, 2017), is that designing for durability, both physically and emotionally, is considered as a prerequisite for implementing circular services, the 'repair service' model, 'the access and performance' model, and the 'extending product value' model.

Similar to the 'classic long life' model, the 'encourage sufficiency' model is implemented by a high number of the studied companies. Clearly, the clothing companies in Finland focus on long-lasting, timeless designs and emotional durability in addition to physical durability, the important aspects to support long product life (Koszewska, 2018). In addition, these companies often offer versatile and seasonless items. The need for these long-life items to both look and feel good and to be practical is highlighted. Several companies have a policy to not do seasonal sales and many companies encourage their customers to make carefully considered purchases. To further support the long life of their items, more than half of the studied companies offer extensive care instructions on their web page and some in addition have care products for sale. Truly, these companies operate as opposed to the industry standard and the fast fashion business model, characterised by

high amount of sales, short use phases and huge amount of waste (Niinimäki and Hassi, 2011).

The repair service is offered by a bit more than one fourth of all the studied companies. Bocken et al. (2016) state that the premium pricing of the items in the long life models cover the high level of services. According to the findings of this thesis, different realities exist. Some companies do offer the service for free, and this is the case with items with extended product guarantee as well. Other companies offer the service against a small fee, while some with a standard pricing for different maintenance and repair services. It seems that the more established services typically have a standard pricing. Still, the service might not generate huge direct profits for the company, but on the other hand, is considered important in terms of customer loyalty. The customers can rely on these companies no matter what. The increased customer loyalty was discussed by Tukker (2004) as well. In practice, these services are conducted either in-house or with a local partner, as suggested by EMF (2017). An interesting finding from the interviews is that the companies want to operate the service themselves as they feel like they have the best knowledge of their items. In the literature review, Lacy and Rutqvist (2015), for example, stated that often these services are conducted with a partner. However, some of the interviewed companies also stated that they would take a partner if the demand for the service would grow. The repair, and especially the maintenance service seem to be especially suitable for certain types of items, for example for items made of natural materials only. Other than repair service, examples of alteration service were also found. The idea behind these services is that a well-fitting and pleasant item stays in use for long. This service was not specifically discussed in the reviewed literature on CBMs.

The ‘extending resource value’ model in this thesis considers a wide variety of recycled, repurposed and leftover materials, including waste materials both from the textile and clothing industry and other industries. These materials are used by almost half of the studied companies in different volumes. Many companies are planning to increase the amount in the future. The materials from other industries include recycled polyester, recycled nylon and repurposed or leftover leather from the furniture industry, while the rest of the materials range from recycled cotton and wool to repurposed industrial textiles and

leftover fabrics from local factories. Using waste materials from other industries might not fit under the idea of closed loops in CE, but then again, authors do refer to the carpet manufacturer Interface that uses discarded fishing nets as a raw material for carpets as an example of the model (Bocken et al., 2016; Lacy and Rutqvist, 2015). Also Geyer et al. (2015) argue that the environmental benefits depend on the type and amount of material replaced, and not so much whether the recycling is "open" or "closed loop". On the other hand, EMF (2017) raises the concern that the use of waste material from other industries might slow down the actual "closed loop" recycling. However, they state that today, the majority of recycled materials used for clothing come from other industries. This is because the recycling technologies are still being developed (Niinimäki et al., 2020; Pal and Gander, 2018). By extending the value of multiple resource types both within the industry and from other industries, these companies again stand out as pioneers. Based on the interviews it can be concluded that close relationships with the manufacturers and material providers are important, as stated by Lewandowski (2016) as well. As opposed to the suggestion by Bocken et al. (2016), the recycled materials are typically more expensive compared to their virgin alternatives, which was also noted by EMF (2017). However, it is possible to do profitable business and create additional customer value by offering items made of "waste" materials, as agreed by Bocken et al. (2016).

The least implemented CBM type by the studied companies is the 'access and performance' model, with only a few of them engaging in the model. Besides, these rental services are rather recent and small scale, and to be developed further. The slow implementation goes hand in hand with the findings of the literature review, where for example Tukker (2015) and Armstrong (2015) identified multiple factors that might hinder consumer acceptance of the use-based models. From the interviews it came up that while interest towards the service exists, it is still a rather new concept for many, as agreed by EMF (2017). In the case of these companies, the rental selection includes unique pieces that are intended to be shared only. By offering items for rent, the companies can offer their high-quality items to a wider audience, as discussed by Bocken et al. (2016) as well. Interestingly, one company offering menswear noted that rental services might not be of interest to men in a similar manner to women that are typically more interested in frequent change.

Finally, the ‘extending product value’ model, the take-back and reuse services, are implemented by a bit more than a fourth of the studied companies. As in the case of repair service, the implementation methods vary. For example, some companies take back items only suitable for reuse, while others take back items both suitable for reuse and at the end of their life as a piece of clothing. As stated by Stål and Corvellec (2018) in the literature review, the take-back service is typically incentivised with a voucher or a discount coupon. Some companies provide the service in cooperation with online second-hand companies, instead of having their own service. The returned items are reused and recycled in multiple ways. They are either resold at the company’s own channels, upcycled to new items, donated to second-hand operators, or downcycled to other industries. While the material recycling into new textile fibres is discussed by some of the companies, it is not a viable option yet due to the limitations of the recycling technologies as discussed in the literature review (Niinimäki et al., 2020). One of the studied companies having its own recycled material is using the returned items in research and development projects hoping to be able to use them as raw materials for new textiles in the future. The items that are resold to new customers in the companies’ own channels are carefully maintained, either in-house or with a partner. Prior to setting up the service, the companies had noticed the high resale value of their items and wanted to offer an easy alternative for their customers to sell and buy used items, as discussed by EMF (2017) as well. These services have been very popular, and the companies believe to have attracted new customers as the prices of the second-hand items are lower. At the time of conducting the interviews for the thesis, some companies were developing new services, which indicates that these services might come even more common in the near future.

To summarise the discussion and analysis by far, the findings of the study are much supported by the findings of the reviewed literature. The CBM types proposed by Bocken et al. (2016) work well together with the empirical findings even though slight adjustments were made to the models. Truly, there are multiple sub models for circularity that can be implemented by manufacturing clothing companies alone or combined. As the studied companies are industry pioneers, they are all engaged in the long life models and many of them in multiple models. This way, they can reduce the use of resources and the related environmental impacts. The figure 5 below provides an overview of the amounts of

different CBM type examples found among the studied companies. Clearly, the circular economy in the textile and clothing industry is becoming a major topic, the practical implementation being led by the industry pioneers.

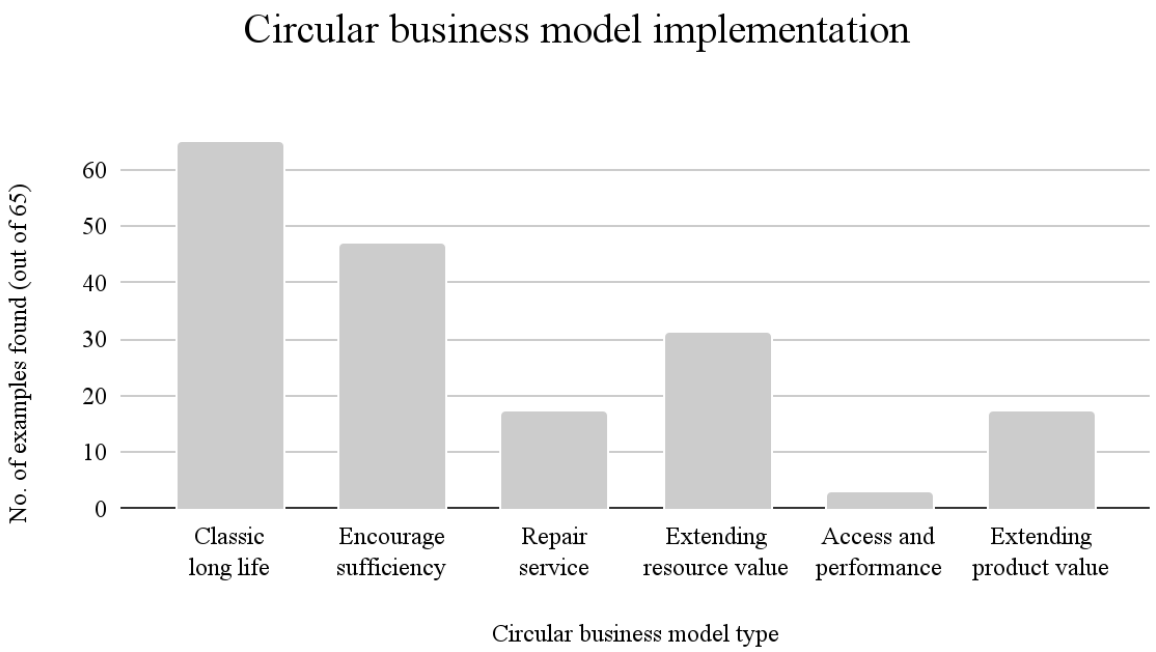

Figure 5. Number of CBM type examples found.

Considering the drivers, enablers and challenges for CBM implementation, it is important to note that for all the studied companies, this time the seven interviewed companies, sustainability is a core value. Their operations have been built around sustainability and circularity since the very beginning. This most likely, in addition to working as an important driver and enabler, has also positively affected the amount of challenges encountered. Truly, the studied companies want to operate sustainably and see no other option for them to do business. Similarly Rizos et al. (2016) identified the company's environmental culture as the biggest enabler. Other organisational drivers and enablers found were related to young company culture, skills and knowledge (Rizos et al., 2016), and culture of constant development. The increasing awareness on sustainability was identified as the other major driver, this again being supported by the literature (de Jesus and Mendonça, 2018; Todeschini et al., 2017). It is seen to increase the demand for circular and sustainable products and services. Additionally, customer demand has been an

important driver for setting up the circular services for these companies, and for companies in previous studies as well (de Jesus and Mendonça, 2018; Rizos et al., 2016; Todeschini et al., 2017).

Besides, as discussed above, the high quality of the items has been a major enabler for implementing circular services. This was highlighted in the reviewed literature as well (Armstrong, 2015; EMF, 2017). The circular services have felt as natural continuums to the quality items of the studied companies. In the literature, collaboration between different stakeholders, including suppliers, customers and other companies was identified as an enabler (Todeschin et al., 2017). While collaboration with other companies was discussed by only one of the interviewed companies, and not in the context of enablers, supplier-related enablers were identified and also the active role of customers was discussed. Interestingly economic and institutional drivers were not found at all, whereas for example, de Jesus and Mendonça (2018) found those to be the biggest ones together with social factors. This could be explained by the strong internal drive of these companies to promote sustainability and a circular economy.

Interestingly, the biggest challenge for the studied companies is related to communication. In the reviewed literature, this was not identified as a challenge. The studied companies are trying to figure out the best way to communicate the circularity and sustainability of their items, and the circular services to the customers. Often, things remain unmentioned as they feel so obvious for the company. To support the communication, common guidelines would be welcomed. The greenwashing phenomenon, and the overuse of the word ‘sustainability’ add to the challenge. This is an interesting finding as companies do have an important role in communicating, educating, motivating and engaging the consumers to participate in a circular fashion system (Kant Hvass and Pedesen, 2019), and hence, should be given more attention in future research. In the reviewed literature, the major challenges were instead related to lack of support from demand and supply networks (Rizos et al., 2016). The companies in this study clearly have found a supporting customer base.

The second biggest challenge found in this study was related to information finding, also identified by Rizos et al. (2016). Information on circular economy and examples of best

practices are considered time-consuming and difficult to find by few of the studied companies. This hopefully would change as the amount of research projects on circular textiles in Finland is increasing. Other challenges were each discussed by only one of the studied companies. These include negative communication around the industry, predicting the changing demand, price sensitivity of customers, availability of materials, cultural differences in sustainability thinking, shortening the supply chain, balancing between the quality and price of materials, durability of materials under high strain, ability of recycled material to present colours, lack of resources, and scaling up the business. For example the lack of resources was one of the major challenges identified in previous literature (de Jesus and Mendoca, 2018; Rizos et al., 2016). The reason why each of these challenges were raised by only one of the companies might be related to the fact that the product types and ways of implementing circularity vary between the companies. To conclude, the challenges faced by the companies in this study differ from the ones identified in previous literature. This can be explained by the fact that the challenges companies face are highly context specific (Tura et al., 2019). The finding that smaller, born-sustainable companies typically encounter less challenges (Todeschini et al., 2017), especially at the organisational level (Guldmann and Huulgaard, 2020), is supported by the findings of this study identifying only two common challenges for successful circular business model implementation.

6. Conclusions

The final chapter of the thesis summarises the main findings and the answers to the research questions of the study. In addition, it discusses the theoretical contribution and practical implications. Finally, it discusses the limitations of the study and proposes avenues for future research.

6.1. Main findings and theoretical contribution

In the thesis, I aimed to answer the research questions, *how do Finnish manufacturing clothing companies implement circularity in their business models*, and *what are the drivers, enablers and challenges for circular business model implementation*, by studying a total amount of 65 Finnish manufacturing clothing companies, and seven of them more

closely. The findings of the study demonstrate that these companies, indeed, are pioneers in circular business model implementation, all of them engaging in at least one circular business model type, and many of them in multiple types simultaneously. The circular business model types proposed by Bocken et al. (2016) were applied in the study and modified based on the empirical findings to be suitable for mapping the possible CBM types for manufacturing clothing companies. These CBM types are *classic long life, encourage sufficiency, repair service, extending resource value, access and performance, and extending product value*. Truly, these types can be implemented alone or combined, and thus, can be rather seen as sub models. While all of the types can be implemented alone or even all of them combined, the long life models, especially the 'classic long life' model meaning high-quality and durable items, seem to be a prerequisite for implementing the service-based models, the 'repair service', 'access and performance', and 'extending product value'. As all the studied companies are engaged in the 'classic long life' model, and most of them in 'the encourage sufficiency' model considering the emotional durability, they are in a great position of further implementing circularity, many of them already doing so.

The 'classic long life' model is implemented by designing durable items from high-quality materials, and the 'encourage sufficiency' model by designing timeless items, offering environmentally-friendly care instructions and not doing seasonal sales, for example. In addition, almost half of the studied companies engage in the 'extending resource value' model by creating value from different types of recycled, repurposed or leftover materials. The 'repair service' model and 'extending product value' model were implemented by a bit more than a quarter of the studied companies, and different ways to operate the models exist. The 'access and performance' model was the least implemented CBM type with only three of the studied companies engaging in the model by offering unique items for short term rental.

To answer the second research question, a number of drivers, enablers and challenges for CBM implementation were identified. These were found under categories 'social', 'supply chain', 'organisational' and 'product', and in the case of challenges, also under categories 'economic' and 'technological and informational'. As opposed to previous literature,

nothing was found under the category ‘institutional’. The main enablers and drivers found in this study are *sustainability as a core value, increasing awareness on sustainability issues, supportive customers, customer demand*, and *suitability of high-quality items for circular services,* whereas the main challenges are *communicating circularity and sustainability* and *finding information on circular practices.* Other than these, a number of drivers, enablers and challenges were found that were each discussed by one company only.

The findings on CBM implementation and CBM implementation in the context of clothing specifically are widely supported by the findings of previous research, including that different CBM types can be implemented combined, especially in the case of born-sustainable companies. Aiming for long product life was most important for the studied companies, similar to previous literature stating that reuse should be preferred over recycling. Some differences, or rather alternative operation modes were found regarding the practical implementation of the models, but mainly they were supported by existing research. Similarly the drivers and enablers identified in this study were supported by previous findings with the exclusion of economic and institutional drivers that were not found in this study. The challenges encountered by the studied companies differ most from the ones reported in previous research and for example the most common challenge in this study, that of communicating circularity, was not discussed in the reviewed literature at all.

The main theoretical contribution of the study is the framework of possible CBM types, sub models, for manufacturing clothing companies. As the framework was developed based on the CBM types proposed by Bocken et al. (2016), it contributes to the suggestion for future research by the authors to test the identified business models and develop them further. Importantly, the study contributes to filling the identified research gap, that of practical examples of circular business model implementation, by providing examples from the textile and clothing industry. What is more, the examples focus on slowing the loop models that have been previously less examined. In addition, the study contributes to the theoretical understanding of the drivers, enablers and barriers for CBM implementation, even though being context specific.

6.2. Managerial implications

The findings of the study and the proposed framework of possible circular business model types for manufacturing clothing companies can support companies in better understanding their opportunities and in (further) implementing circularity in their business models. Important managerial implications of this study include that by engaging in the circular business models, companies can create additional customer and economic value in addition to creating environmental value by extending the life of items and materials. As the awareness on sustainability challenges and the amount of consumers valuing sustainability and circularity increases, by engaging in CBMs, companies can attract new customers and answer to the increasing demand for circular and sustainable offerings. Besides, by offering high-quality items and high level of services, the companies create additional value to their customers in general, as opposed to creating value only to customers valuing circularity. As a result, the amount of loyal customers may increase, this way providing financial benefits for the company. Other than this, economic value can be captured through additional revenue from services and the sales of second-hand items. What is more, the findings of the study provide an overview of the drivers and enablers and the possible challenges encountered when implementing circular business models. While these are typically context specific, acknowledging at least the common factors identified in the study can support businesses when implementing circularity in their business models.

In addition to implications for manufacturing clothing companies, the results of the study contribute in the general understanding of circular economy management, one of the core research areas of FINIX, and in the understanding of the role of the manufacturing clothing companies, the brands, in a circular textile ecosystem. For example, the findings reveal the need for support in communicating circularity to customers and in information finding on circular economy and the best practices.

6.3. Limitations and suggestions for further research

Considering the limitations of the study, first of all, the studied 65 companies were small, with the yearly revenue below 5 million, hence, no large companies were included. While

the CBM types identified in the study supposedly work well in the context of large companies as well, differences in the practical implementation may exist. For example, the role of partners might be bigger for larger companies, and the economic impacts might need to be more carefully analysed. While the small companies can implement circular business models step by step with a rather low risk, the larger companies might need to consider and prepare the decisions more thoroughly. Besides, the companies in this study can be considered as industry pioneers as they had been included in the list used as a basis for the study based on their circular approaches. Hence, this study does not provide a realistic picture of the state of the industry as a whole. However, worth noting is that the small companies do represent a majority of clothing companies in Finland. In future research, CBM implementation could be studied in the context of larger companies and companies not considered pioneers in circularity, for example by applying the framework of potential CBM types for manufacturing clothing companies proposed in this study.

Importantly, as the CBM types proposed by Bocken et al. (2016) were used in the study, the study focused on slowing and closing the loop business models and not on narrowing the loop business models. While some examples of zero waste operations were found in the empirical data, they were not included in the study due to being in such a small role and falling under narrowing loops. For example Lacy and Rutqvist (2015) proposed a CBM type, the ‘recovery and recycling’ model that also covers the zero waste operations, meaning that by-products or waste from production is recovered to create value. This and other opportunities exist for manufacturing clothing companies to engage in narrowing the loop models that can be given attention in future research. What is more, other than design for durability, the circular design strategies were not given much attention in the study and for example designing for technological and biological cycles were not included. These again would have been considered under the ‘circular supply-chain’ model by Lacy and Rutqvist (2015). Hence, circular design strategies for clothing companies could be examined in future research.

Finally, the fact that communicating circularity was identified as the biggest common challenge for the interviewed companies should be acknowledged in two ways. First of all, as the circular actions of the 65 companies in the study were examined based on the

information on their web page, it can be questioned whether the information is complete if these companies share the challenge of communicating circularity. Most importantly, as the topic was much discussed by the interviewed companies and identified as the most common challenge, it should be given more attention in future research. This is especially as companies have an important role in engaging consumers to participate in a circular economy, and communication plays a key role. To conclude, based on this study, further research on CBM implementation by large manufacturing clothing companies, research on narrowing the loop models and on circular design strategies, and research on circularity communication is suggested.

References

Amit, R. & Zott, C. (2012). Creating Value Through Business Model Innovation. *MIT Sloan Management Review,* 53(3), 41–49.

Amit, R. & Zott, C. (2001). Value creation in e-business. *Strategic Management Journal*, 22, 493–520. http://dx.doi.org/10.1002/smj.187

Antikainen, M. & Valkokari, K. (2016). A Framework for Sustainable Circular Business Model Innovation. *Technology Innovation Management Review*, 6(7), 5–12. http://doi.org/10.22215/timreview/1000

Armstrong, C. M., Niinimäki, K., Kujala, S., Karell, E., & Lang, C. (2015). Sustainable product-service systems for clothing: Exploring consumer perceptions of consumption alternatives in Finland. *Journal of Cleaner Production*, 97, 30–39. https://doi.org/10.1016/j.jclepro.2014.01.046

Ayres, R.U. (1994). Industrial metabolism; theory and policy. In: Allenby, B. R., Richards, D. J. (eds.), *The Greening of Industrial Ecosystems*. Washington, DC: National Academy Press, 23–37.

Benyus, J. M. (1997). *Biomimicry.* New York: William Morrow.

Bocken, N., Miller, K., Weissbrod, I., Holgado, M., & Evans, S. (2019). Slowing Resource Loops in the Circular Economy: An Experimentation Approach in Fashion Retail. In: D. Dao, R. J. Howlett, R. Setchi, & L. Vlacic (eds), *Sustainable Design and Manufacturing*. Springer International Publishing, 164–173. https://doi.org/10.1007/978-3-030-04290-5_17

Bocken, N. M. P., Schuit, C. S. C., & Kraaijenhagen, C. (2018). Experimenting with a circular business model: Lessons from eight cases. *Environmental Innovation and Societal Transitions*, 28, 79–95. https://doi.org/10.1016/j.eist.2018.02.001

Bocken, N. M. P., de Pauw, E., Bakker, C. and van der Grinten, B. (2016). Product design and business model strategies for a circular economy. *Journal of Industrial and Production Engineering*, 33(5), 308–320. doi: 10.1080/21681015.2016.1172124.

Bocken, N. M. P., & Short, S. W. (2016). Towards a sufficiency-driven business model: Experiences and opportunities. *Environmental Innovation and Societal Transitions*, 18, 41–61. https://doi.org/10.1016/j.eist.2015.07.010

Bocken, N. M. P., Short, S. W., Rana, P., & Evans, S. (2014). A literature and practice review to develop sustainable business model archetypes. *Journal of Cleaner Production*, 65, 42–56. https://doi.org/10.1016/j.jclepro.2013.11.039

Boons, F., & Lüdeke-Freund, F. (2013). Business models for sustainable innovation: State-of-the-art and steps towards a research agenda. *Journal of Cleaner Production*, 45, 9–19. https://doi.org/10.1016/j.jclepro.2012.07.007

Boulding, K. E. (1966). The economics of the coming spaceship Earth. In: H. Jarrett (ed), *Environmental quality issues in a growing economy*. Baltimore, MD: Johns Hopkins University Press, 3–14.

Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative Research in Psychology*, 3(2), 77–101. https://doi.org/10.1191/1478088706qp063oa

Bressanelli, G., Perona, M., & Saccani, N. (2019). Challenges in supply chain redesign for the Circular Economy: A literature review and a multiple case study. *International Journal of Production Research*, 57(23), 7395–7422. https://doi.org/10.1080/00207543.2018.1542176

Brundtland, G. H. (1987). *Our Common Future*. Report of the World Commission on Environment and Development. [pdf] The United Nations. Available at: https://sustainabledevelopment.un.org/content/documents/5987our-common-future.pdf [Accessed 17 June 2021].

Dahlbo, H., Aalto, K., Eskelinen, H., & Salmenperä, H. (2017). Increasing textile circulation—Consequences and requirements. *Sustainable Production and Consumption*, 9, 44–57. https://doi.org/10.1016/j.spc.2016.06.005

de Jesus, A., & Mendonça, S. (2018). Lost in Transition? Drivers and Barriers in the Eco-innovation Road to the Circular Economy. *Ecological Economics*, 145, 75–89. https://doi.org/10.1016/j.ecolecon.2017.08.001

Ellen MacArthur Foundation (2017). *A new textiles economy: Redesigning fashion's future.* [pdf] Ellen MacArthur Foundation. Available at: http://www.ellenmacarthurfoundation.org/publications [Accessed 13 January 2021].

Ellen MacArthur Foundation (2015a). G*rowth Within: a circular economy vision for a competitive Europe*. [pdf] Ellen MacArthur Foundation. Available at: http://www.ellenmacarthurfoundation.org/publications [Accessed 5 June 2020].

Ellen MacArthur Foundation (2015b). *Towards a circular economy: Business rationale for an accelerated transition*. [pdf] Ellen MacArthur Foundation. Available at: http://www.ellenmacarthurfoundation.org/publications [Accessed 25 December 2020].

Ellen MacArthur Foundation (2013). *Towards the circular economy: Economic and business rationale for an accelerated transition.* [pdf] Ellen MacArthur Foundation. Available at: http://www.ellenmacarthurfoundation.org/publications [Accessed 25 December 2020].

Eriksson, P. & Kovalainen, A. (2011). Qualitative Methods in Business Research. London: SAGE Publications Ltd.

European Commission (2020). *Circular Economy Action Plan. For a cleaner and more competitive Europe.* [pdf] European Commission. Available at: https://ec.europa.eu/environment/circular-economy/pdf/new_circular_economy_action_plan.pdf [Accessed 19 October 2020].

FINIX (2020a). #kestävävaate-kampanja. [online] Available at: https://finix.aalto.fi/kestavavaate-kampanja/ [Accessed 5 May 2020].

FINIX (2020b). Q&A #kestävävaate-listaus. [online] Available at: https://finix.aalto.fi/qa-kestavavaate-listaus/ [Accessed 2 July 2020].

Fischer, A., & Pascucci, S. (2017). Institutional incentives in circular economy transition: The case of material use in the Dutch textile industry. *Journal of Cleaner Production*, 155, 17–32. https://doi.org/10.1016/j.jclepro.2016.12.038

Fontell, P. & Heikkilä, P. (2017). *Model of circular business ecosystem for textiles.* Espoo: VTT.

Franco, M. A. (2019). A system dynamics approach to product design and business model strategies for the circular economy. *Journal of Cleaner Production*, 241, 118327. https://doi.org/10.1016/j.jclepro.2019.118327

Franco, M. A. (2017). Circular economy at the micro level: A dynamic view of incumbents' struggles and challenges in the textile industry. *Journal of Cleaner Production*, 168, 833–845. https://doi.org/10.1016/j.jclepro.2017.09.056

Geisendorf, S., & Pietrulla, F. (2018). The circular economy and circular economic concepts-a literature analysis and redefinition. *Thunderbird International Business Review*, 60(5), 771–782. https://doi.org/10.1002/tie.21924

Geissdoerfer, M., Morioka, S. N., de Carvalho, M. M., & Evans, S. (2018). Business models and supply chains for the circular economy. *Journal of Cleaner Production*, 190, 712–721. https://doi.org/10.1016/j.jclepro.2018.04.159

Geissdoerfer, M., Savaget, P., Bocken, N. M. P. & Hultink, E. J. (2017). The Circular Economy – A new sustainability paradigm?. *Journal of Cleaner Production,* 143, 757–768. doi: 10.1016/j.jclepro.2016.12.048

Geyer, R., Kuczenski, B., Zink, T., & Henderson, A. (2015). Common Misconceptions about Recycling. *Journal of Industrial Ecology*, 20(5), 1010–1017. http://doi.org/10.1111/jiec.12355

Ghisellini, P., Cialani, C. & Ulgiati, S. (2016), A review on circular economy: the expected transition to a balanced interplay of environmental and economic systems. *Journal of Cleaner Production*, 114, 11–32. doi: 10.1016/j.jclepro.2015.09.007

Graedel, T. E. & Allenby, B .R. (1995). *Industrial Ecology*. Engle-wood Cliffs, N.J: Prentice Hall.

Guest, G., MacQueen, K. M. & Namey, E. E. (2014). Validity and Reliability (Credibility and Dependability) in Qualitative Research and Data Analysis. In *Applied Thematic Analysis*, 79–106. Thousand Oaks: SAGE Publications, Inc.

Guldmann, E., & Huulgaard, R. D. (2020). Barriers to circular business model innovation: A multiple-case study. *Journal of Cleaner Production*, 243, 118160. https://doi.org/10.1016/j.jclepro.2019.118160

Healy, M., & Perry, C. (2000). Comprehensive criteria to judge validity and reliability of qualitative research within the realism paradigm. *Qualitative Market Research*, 3(3), 118–126. https://doi.org/10.1108/13522750010333861

Heikkilä, P., Fontell, P., Määttänen, M & Harlin, A. (2018). Review of Textile Recycling Ecosystem and a Case of Cotton. In Niinimäki, K. (edit.). *Sustainable Fashion in a Circular Economy,* 192–217.

Henry, M., Bauwens, T., Hekkert, M., & Kirchherr, J. (2020). A typology of circular start-ups: An Analysis of 128 circular business models. *Journal of Cleaner Production*, 245, 118528. https://doi.org/10.1016/j.jclepro.2019.118528

Hofmann, F., & Jaeger‐Erben, M. (2020). Organizational transition management of circular business model innovations. *Business Strategy and the Environment*, 29(6), 2770–2788. https://doi.org/10.1002/bse.2542

Hofmann, F. (2019). Circular business models: Business approach as driver or obstructer of sustainability transitions? *Journal of Cleaner Production*, 224, 361–374. https://doi.org/10.1016/j.jclepro.2019.03.115

Homrich, A. S., Galvão, G., Abadia, L. G., & Carvalho, M. M. (2018). The circular economy umbrella: Trends and gaps on integrating pathways. *Journal of Cleaner Production*, 175, 525–543. https://doi.org/10.1016/j.jclepro.2017.11.064

Jia, F., Yin, S., Chen, L., & Chen, X. (2020). The circular economy in the textile and apparel industry: A systematic literature review. *Journal of Cleaner Production*, 259, 120728. https://doi.org/10.1016/j.jclepro.2020.120728

Kant Hvass, K., & Pedersen, E. R. G. (2019). Toward circular economy of fashion: Experiences from a brand's product take-back initiative. *Journal of Fashion Marketing and Management: An International Journal*, 23(3), 345–365. https://doi.org/10.1108/JFMM-04-2018-0059

Kant Hvass, K. (2014). Post-retail responsibility of garments – a fashion industry perspective. *Journal of Fashion Marketing and Management*, 18(4), 413–430. https://doi.org/10.1108/JFMM-01-2013-0005

Kirchherr, J., Reike, D. & Hekkert, M. (2017). Conceptualizing the circular economy: An analysis of 114 definitions. *Resources, Conservation and Recycling,* 127, 221–232. doi: 10.1016/j.resconrec.2017.09.005.

Kjaer, L. L., Pigosso, D. C. A., Niero, M., Bech, N. M., & McAloone, T. C. (2019). Product/Service‐Systems for a Circular Economy: The Route to Decoupling Economic Growth from Resource Consumption? *Journal of Industrial Ecology*, 23(1), 22–35. https://doi.org/10.1111/jiec.12747

Korhonen, J., Nuur, C., Feldmann, A., & Birkie, S. E. (2018). Circular economy as an essentially contested concept. *Journal of Cleaner Production*, 175, 544–552. https://doi.org/10.1016/j.jclepro.2017.12.111

Koszewska, M. (2018). Circular Economy—Challenges for the Textile and Clothing Industry. *Autex Research Journal*, 18(4), 337–347. https://doi.org/10.1515/aut-2018-0023

Lacy, P. & Rutqvist, J. (2015). *Waste to Wealth. Creating Advantage in a Circular Economy*. London: Accenture.

Lacy, P., Keeble, J., McNamara, R., Rutqvist, J., Haglund, T., Cui, M., ... & Buddemeier, P. (2014). Circular advantage – innovative business models and technologies to create value in a world without limits to growth. Chicago, IL: Accenture.

Levänen, J., Uusitalo, V., Härri, A., Kareinen, E., & Linnanen, L. (2021). Innovative recycling or extended use? Comparing the global warming potential of different ownership and end-of-life scenarios for textiles. *Environmental Research Letters*, 16(5), 054069. https://doi.org/10.1088/1748-9326/abfac3

Lewandowski, M. (2016). Designing the Business Models for Circular Economy—Towards the Conceptual Framework. *Sustainability,* 8(1), 43. doi: 10.3390/su8010043.

Lieder, M., & Rashid, A. (2016). Towards circular economy implementation: A comprehensive review in context of manufacturing industry. *Journal of Cleaner Production*, 115, 36–51. https://doi.org/10.1016/j.jclepro.2015.12.042

Linder, M., & Williander, M. (2017). Circular Business Model Innovation: Inherent Uncertainties. *Business Strategy & the Environment (John Wiley & Sons, Inc)*, 26(2), 182–196. https://doi.org/10.1002/bse.1906

Lovins, A. B., Lovins, L. H., Hawken, P. (1999). *Natural Capitalism: the Next Industrial Revolution*. London: Earthscan.

Lüdeke-Freund, F., Gold, S., & Bocken, N. M. P. (2019). A Review and Typology of Circular Economy Business Model Patterns. *Journal of Industrial Ecology*, 23(1), 36–61. https://doi.org/10.1111/jiec.12763

Lüdeke-Freund, F. (2010). Towards a conceptual framework of business models for sustainability. In: *ERSCP-EMU Conference, Delft, The Netherlands*, 1–28.

Lyle, J. T. (1994). *Regenerative design for sustainable development.* New York: John Wiley & Sons, Inc.

Magretta, J. (2002). Why business models matter. *Harvard Business Review*, 80(5), 86–92.

Manninen, K., Koskela, S., Antikainen, R., Bocken, N., Dahlbo, H., & Aminoff, A. (2018). Do circular economy business models capture intended environmental value propositions? *Journal of Cleaner Production*, 171, 413–422. https://doi.org/10.1016/j.jclepro.2017.10.003

McDonough, W., Braungart, M. (2002). *Cradle to Cradle: Remaking the Way We Make Things*. New York: North Point Press.

Mendoza, J. M. F., Sharmina, M., Gallego‐Schmid, A., Heyes, G., & Azapagic, A. (2017). Integrating Backcasting and Eco-Design for the Circular Economy: The BECE Framework. *Journal of Industrial Ecology*, 21(3), 526–544. https://doi.org/10.1111/jiec.12590

Merli, R., Preziosi, M. and Acampora, A. (2018). How do scholars approach the circular economy? A systematic literature review. *Journal of Cleaner Production*, 178, 703–722. doi: 10.1016/j.jclepro.2017.12.112.

Ministry of the Environment (2020). *Strategic programme to promote a circular economy.* [online] Available at: https://ym.fi/en/strategic-programme-to-promote-a-circular-economy [Accessed 11 October 2020]

Mont, O. K. (2002). Clarifying the concept of product–service system. *Journal of Cleaner Production*, 10(3), 237–245. https://doi.org/10.1016/S0959-6526(01)00039-7

Moreno, M., De los Rios, C., Rowe, Z., & Charnley, F. (2016). A Conceptual Framework for Circular Design. Sustainability, 8(9), 937. https://doi.org/10.3390/su8090937

Murray, A., Skene, K., & Haynes, K. (2017). The Circular Economy: An Interdisciplinary Exploration of the Concept and Application in a Global Context. *Journal of Business Ethics*, 140(3), 369–380. https://doi.org/10.1007/s10551-015-2693-2

Niinimäki, K., Peters, G., Dahlbo, H., Perry, P., Rissanen, T., & Gwilt, A. (2020). The environmental price of fast fashion. *Nature Reviews Earth & Environment*, 1(4), 189–200. https://doi.org/10.1038/s43017-020-0039-9

Niinimäki, K., & Hassi, L. (2011). Emerging design strategies in sustainable production and consumption of textiles and clothing. *Journal of Cleaner Production*, 1876–1883. https://doi.org/10.1016/j.jclepro.2011.04.020

Nußholz, J. L. K. (2017). Circular Business Models: Defining a Concept and Framing an Emerging Research Field. *Sustainability*, 9(10), 1810. doi: http://dx.doi.org/10.3390/su9101810.

Osterwalder, A. & Pigneur, Y. (2010). *Business Model Generation: A Handbook for Visionaries, Game Changers, and Challengers.* New York: John Wiley and Sons.

Pal, R., & Gander, J. (2018). Modelling environmental value: An examination of sustainable business models within the fashion industry. *Journal of Cleaner Production*, 184, 251–263. https://doi.org/10.1016/j.jclepro.2018.02.001

Pauli, G. A. (2010). *The Blue Economy: 10 Years, 100 Innovations, 100 Million Jobs*. Taos NM: Paradigm Publications.

Pearce, D. W., & Turner R. K. (1989). *Economics of natural resources and the environment.* Baltimore, MD: Johns Hopkins University Press.

Pedersen, E. R. G., Earley, R., & Andersen, K. R. (2019). From singular to plural: Exploring organisational complexities and circular business model design. *Journal of Fashion Marketing and Management: An International Journal,* 23(3), 308–326. https://doi.org/10.1108/JFMM-04-2018-0062

Pedersen, E. R. G., Gwozdz, W., & Hvass, K. K. (2018). Exploring the Relationship Between Business Model Innovation, Corporate Sustainability, and Organisational Values within the Fashion Industry. *Journal of Business Ethics*, 149(2), 267–284. https://doi.org/10.1007/s10551-016-3044-7

Pieroni, M. P. P., McAloone, T. C. & Pigosso, D. C. A. (2019). Business model innovation for circular economy and sustainability: *A review of approaches. Journal of Cleaner Production*, 215, 198–216. doi: 10.1016/j.jclepro.2019.01.036.

Rattalino, F. (2018). Circular advantage anyone? Sustainability-driven innovation and circularity at Patagonia, Inc. *Thunderbird International Business Review*, 60(5), 747–755. https://doi.org/10.1002/tie.21917

Richardson, J. (2008). The business model: An integrative framework for strategy execution. *Strategic Change*, 17(5–6), 133–144. https://doi.org/10.1002/jsc.821

Rizos, V., Behrens, A., van der Gaast, W., Hofman, E., Ioannou, A., Kafyeke, T., Flamos, A., Rinaldi, R., Papadelis, S., Hirschnitz-Garbers, M. & Topi, C. (2016). Implementation of Circular Economy Business Models by Small and Medium-Sized Enterprises (SMEs): Barriers and Enablers. *Sustainability*. *Multidisciplinary Digital Publishing Institute*, 8(11), 1212. doi: 10.3390/su8111212.

Rosa, P., Sassanelli, C. & Terzi, S. (2019). Towards Circular Business Models: A systematic literature review on classification frameworks and archetypes. *Journal of Cleaner Production*, 236, 117696. doi: 10.1016/j.jclepro.2019.117696.

Sobh, R., & Perry, C. (2006). Research design and data analysis in realism research. *European Journal of Marketing*, 40(11/12), 1194–1209. https://doi.org/10.1108/03090560610702777

Stahel, W. R. (2016). The Circular Economy. *Nature*, 531(7595), 435–438. doi:10.1038/531435a

Stahel, W. R. (2010). *The Performance Economy*. London: Palgrave-MacMillan.

Stahel, W. R. (1994). The utilization focused service economy: Resource efficiency. In: Allenby, B. R. & Richards, D. J. (eds), *The Greening of Industrial Ecosystems*. Washington, DC: National Academy Press, 178–190.

Stål, H. I., & Corvellec, H. (2018). A decoupling perspective on circular business model implementation: Illustrations from Swedish apparel. *Journal of Cleaner Production*, 171, 630–643. https://doi.org/10.1016/j.jclepro.2017.09.249

Teece, D. J. (2010). Business Models, Business Strategy and Innovation. *Long Range Planning. (Business Models)*, 43(2), 172–194. doi: 10.1016/j.lrp.2009.07.003.

Terry, G., Hayfield, N., Clarke, V. & Braun, V. (2017). Thematic Analysis. In *The SAGE Handbook of Qualitative Research in Psychology,* 17–36. London: SAGE Publications, Ltd.

Todeschini, B. V., Cortimiglia, M. N., Callegaro-de-Menezes, D. & Ghezzi, A. (2017). Innovative and sustainable business models in the fashion industry: Entrepreneurial drivers, opportunities, and challenges. *Business Horizons*, *(The Generative Potential of Emerging Technology)*, 60(6), 59–770. doi: 10.1016/j.bushor.2017.07.003.

Tukker, A. (2015). Product services for a resource-efficient and circular economy – a review. *Journal of Cleaner Production*, 97, 76–91. https://doi.org/10.1016/j.jclepro.2013.11.049

Tukker, A. (2004). Eight types of product–service system: Eight ways to sustainability? Experiences from SusProNet. *Business Strategy and the Environment*, 13(4), 246–260. https://doi.org/10.1002/bse.414

Tukker, A., & Tischner, U. (2006). Product-services as a research field: Past, present and future. Reflections from a decade of research. *Journal of Cleaner Production*, 14(17), 1552–1556. https://doi.org/10.1016/j.jclepro.2006.01.022

Tura, N., Hanski, J., Ahola, T., Ståhle, M., Piiparinen, S., & Valkokari, P. (2019). Unlocking circular business: A framework of barriers and drivers. *Journal of Cleaner Production*, 212, 90–98. https://doi.org/10.1016/j.jclepro.2018.11.202

Urbinati, A., Chiaroni, D., & Chiesa, V. (2017). Towards a new taxonomy of circular economy business models. *Journal of Cleaner Production*, 168, 487–498. https://doi.org/10.1016/j.jclepro.2017.09.047

Vehmas, K., Raudaskoski, A., Heikkilä, P., Harlin, A., & Mensonen, A. (2018). Consumer attitudes and communication in circular fashion. *Journal of Fashion Marketing and Management: An International Journal*, 22(3), 286–300. https://doi.org/10.1108/JFMM-08-2017-0079

Vermunt, D. A., Negro, S. O., Verweij, P. A., Kuppens, D. V., & Hekkert, M. P. (2019). Exploring barriers to implementing different circular business models. *Journal of Cleaner Production*, 222, 891–902. https://doi.org/10.1016/j.jclepro.2019.03.052

Yin, R. K. (2003). Case study research design and methods. Thousand Oaks: Sage publications.

Zink, T., & Geyer, R. (2017). Circular Economy Rebound. *Journal of Industrial Ecology*, 21(3), 593–602. https://doi.org/10.1111/jiec.12545

Zott, C., Amit, R., & Massa, L. (2011). The Business Model: Recent Developments and Future Research. *Journal of Management*, 37(4), 1019–1042. https://doi.org/10.1177/0149206311406265